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CONTENTS, DECEMBER,

Massive Hemorrhage from the Upper Digestive Tract with Special Reference to the Peptic Ulcer 887
G. V. Brindley, M.D.; F. M. Covert, M.D., and S. McL. Long, M.D., Temple, Texas

Stricture of the Common Bile Duct: Etiology and Treatment 898
Harwell Wilson, M.D., and C. Frank Yates, M.D., Memphis

Intramedullary Nailing of Fractures of the Shaft of the Femur 907
Charles T. Berry, M.D., Greenville, Miss.

Sarcoma of the Rectum 916
David Dunavant, M.D., and Clarence E. Gillespie, M.D., Memphis

Diverticulitis of the Colon 922
William A. Johns, M.D., Richmond

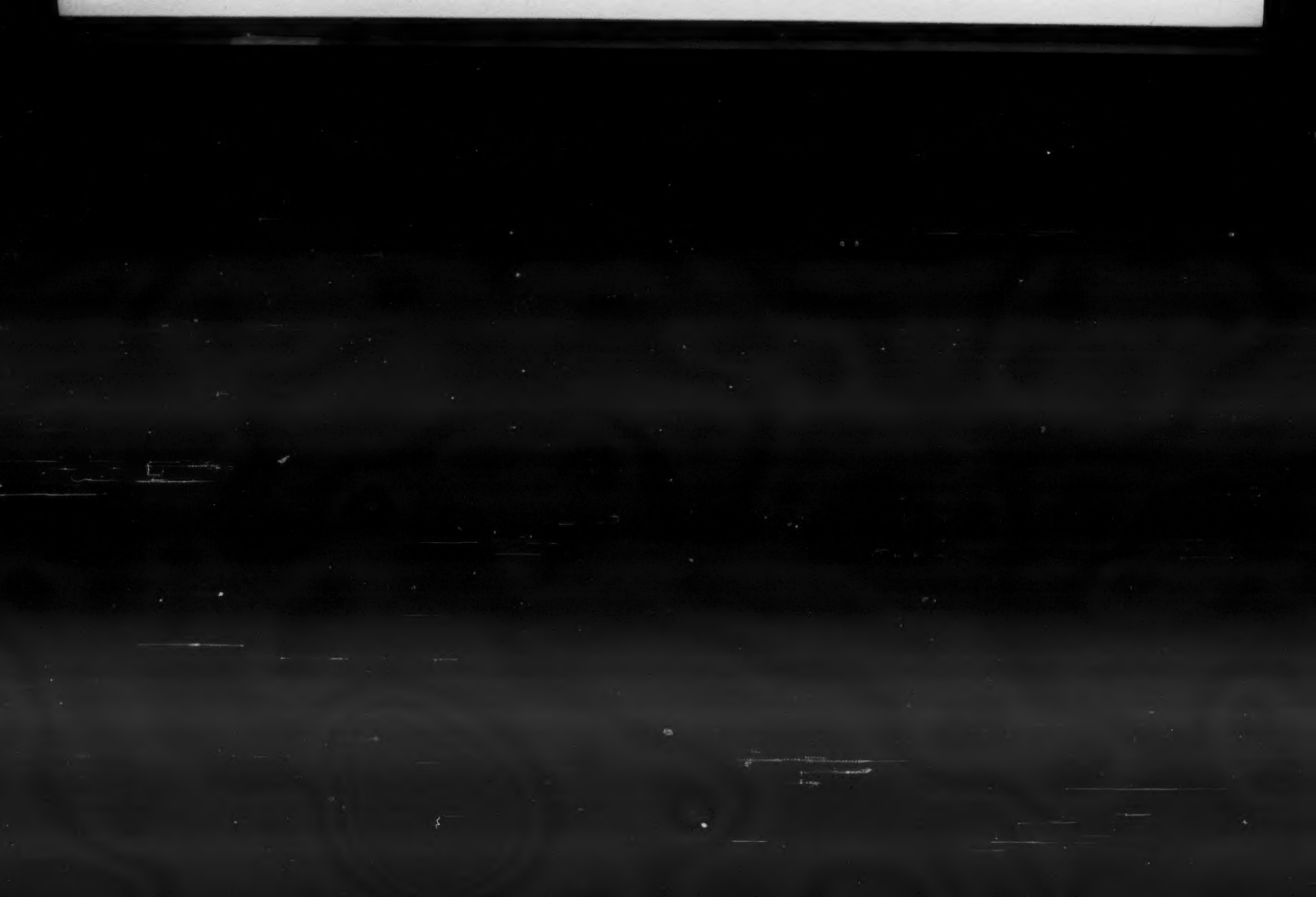
Does the Pathologist Need the Clinician's Cooperation? 927
Peter P. Ladewig, M.D., Montgomery, W. Va.

Editorial: Treatment of Varicose Veins by Excision Preferable to Ligation and Injection 935
William H. Prioleau, M.D., Charleston, S. C.

Book Reviews 937

Abstracts from Current Literature 939

Index to Volume XV 948



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MASSIVE HEMORRHAGE FROM THE UPPER DIGESTIVE TRACT WITH SPECIAL REFERENCE TO THE PEPTIC ULCER

G. V. Brindley, M.D.
F. M. Covert, M.D.
S. McL. Long, M.D.
Temple, Texas

Massive hemorrhage in the upper digestive tract is caused by many pathologic entities. Backus[1] lists 10 intrinsic and 15 extrinsic conditions that may cause massive hemorrhage in this region.

The four most important etiologic factors in hemorrhage of the upper gastrointestinal tract are: duodenal ulcer, gastric ulcer, esophageal varices, and gastritis. Ulcers at the margin of a gastrojejunostomy are considered in the peptic ulcer group which includes ulcers of the stomach and duodenum. Carcinoma of the stomach, duodenum and jejunum sometimes result in massive bleeding. Severe hemorrhage may occur as a result of benign lesions of the stomach or small intestine such as adenoma or polyp. This is rare.

Esophageal varices result from portal obstruction. Cirrhosis of the liver is the most frequent cause. Rarely, the presence of tumor masses in the upper abdomen or congenital anomalies of the portal circulation may result in portal hypertension and lead to dilatation of the esophageal veins. Banti's syndrome is nothing more than an enlargement of the spleen due to chronic passive congestion secondary to portal obstruction. The enlarged spleen does not contribute per se to the development of esophageal varices.

The blood dyscrasias occasionally are associated with severe gastrointestinal hemorrhage, and this may be most pronounced in

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the upper gastrointestinal tract. Hoerr[2] studied 191 patients with acute massive hemorrhage and found that 120 of these were due to duodenal ulcers, 15 resulted from gastric ulcers, 6 from jejunal ulcers, 5 from gastric neoplasms, 17 from acute gastritis, and 14 from ruptured esophageal varices. In 8 cases, the site of hemorrhage was undetermined, and six other cases were recorded as "miscellaneous."

Statistical data indicate that from 80 to 90 per cent of all cases of severe upper gastrointestinal bleeding occur in patients in whom there is an intrinsic lesion in the stomach or duodenum. Hartman[3] states that 90 per cent of the cases of gastrointestinal bleeding are intrinsic. Shirer[4] found that peptic ulcer was the source of bleeding in 75 per cent of the cases of hematemesis. The most frequent cause of bleeding is a duodenal ulcer. It probably accounts for 60 per cent of all hemorrhages of the upper gastrointestinal tract. A review of the literature would indicate that approximately 20 per cent of duodenal ulcers bleed. The survey of cases upon which this report is based corroborates this observation. The duodenal ulcer which most frequently bleeds is located on the posterior wall and usually has eroded into the pancreaticoduodenal artery. However, it is the opinion of Rivers and Wilbur[5] that most hemorrhages are not due to penetration of an ulcer into a large blood vessel, but that bleeding occurs from small vessels in and near the ulcerated area.

Gastric ulcer probably is the second most frequent cause of gastrointestinal bleeding. Approximately 30 per cent of the patients with gastric ulcer bleed. In our series, 32 per cent had a history of bleeding. A bleeding gastric ulcer is more serious than is a bleeding duodenal ulcer. The gastric ulcer which most often bleeds profusely is located along the lesser curvature of the stomach, and sometimes it may erode into the left gastric artery. While about one third of the ulcers at the margin of a gastroenterostomy bleed, it is not often that bleeding from a marginal ulcer is of such degree as to produce profound shock. However, bleeding from these ulcers is slow to respond to conservative management. Bleeding was present in all of the marginal ulcers encountered in this survey. Carcinoma of the stomach often produces bleeding but rarely causes a massive loss of blood. Profuse bleeding due to carcinoma is seen in the ulcerating type of lesion and may occur in a peptic ulcer that is undergoing malignant change.

It might be well to ask the question, "What constitutes a massive hemorrhage?" It is believed that some of the apparent discrepancies in statistics pertaining to this condition are due to the fact that careful delineation as to the type or character of hemorrhage is not made. Metheny and Greene state that the amount of blood loss

must be extensive, not merely with respect to the total cellular depletion, but more specifically to the rate of depletion. The presence of obvious shock is associated with blood loss in excess of 2,000 c.c. Bohrer[6] interprets a massive hemorrhage as one which results in a reduction of the hemoglobin to 35 per cent or less and the erythrocyte count to two million or less. Such an interpretation of a massive hemorrhage excludes those cases of moderate hemorrhage which carry no mortality.

Since peptic ulcer accounts for approximately 75 per cent of all massive hemorrhage of the upper digestive tract, the following data which are submitted for consideration were obtained by a survey of 1264 peptic ulcers. Particular attention has been paid to the bleeding peptic ulcers in this study. The frequency of bleeding, the severity of bleeding, the x-ray findings in bleeding ulcers, the surgical therapy of bleeding ulcers, and the mortality will be considered. All of the cases of non-bleeding ulcers which were not operated upon showed a positive x-ray study in that this paper did not include any cases diagnosed from clinical history and physical examination only.

CHART 1

Type of Ulcer in 1252 Cases

Type	No. of Cases	Per Cent of Total
Gastric	47	3.75
Duodenal	1188	94.89
Gastric and Duodenal	12	0.96
Marginal	5	0.40
Total	1152	100.00

Of 1252 cases of peptic ulcer, 47 were gastric, 1188 were duodenal, 12 individuals had both gastric and duodenal ulcers, and 5 ulcers were marginal. Chart 1 shows the types of ulcers in 1252 cases, and it is worthy of comment that in this survey there were found 20 times as many duodenal as gastric ulcers. Of these patients

CHART 2

Incidence of Hemorrhage in 1252 Cases of Peptic Ulcer

Type Ulcer	Number of Cases	Hemorrhages	Per Cent with Hemorrhage
Gastric	47	15	31.9
Duodenal	1188	229	19.2
Gastric and Duodenal	12	4	33.3
Marginal	5	5	100.0

14.38 per cent received surgical therapy. There were some cases in which surgical therapy was recommended but was refused by the patient. Chart 2 indicates that the incidence of bleeding is higher in the gastric than in the duodenal ulcer. Approximately one peptic ulcer out of five bleeds. Chart 3 gives the degree of blood loss in

CHART 3

Degree of Blood Loss in 253 Patients with Hemorrhage

Type Ulcer	Number Cases	Moderate	Severe
Gastric	15	9	6
Duodenal	229	152	77
Gastric and Duodenal	4	3	1
Marginal	5	1	4
Total	253	165	88

253 patients with bleeding ulcers. Particularly should it be noted that only 88 cases, or 7 per cent, of this series surveyed had a massive hemorrhage, that is, one patient in 14 with a peptic ulcer had profuse bleeding. Of the 47 cases of gastric ulcer seen at Scott & White Clinic, 15 (32 per cent) had hemorrhages as outlined in Chart 3. Nine of these bled moderately and 6 had severe hemorrhages. The erythrocyte count on admission varied from slightly over one million to over five million, and the hemoglobin ranged from 20 per cent to over 100 per cent. Three of these 6 had an erythrocyte count of less than 3 million and 3 had less than 40 per cent hemoglobin. In addition to bleeding, the ulcer in one case had perforated, and pyloric obstruction was present in another case. Seven individuals had had one hemorrhagic episode; 2 had hemorrhage on two occasions, and 6 had experienced bleeding three or more times. One patient received a single blood transfusion; another received two; and two other cases required four or more blood transfusions. X-ray examination of the gastrointestinal tract showed an ulcer in every instance where there was a history of bleeding except in two cases. One of these showed pyloric obstruction. The other had no roentgenologic evidence of ulcer on the tenth day following hemorrhage, but re-examination on the eighteenth day after hemorrhage revealed an ulcer. An ulcer was demonstrated in 3 cases within one week after hemorrhage. Three other cases were detected between the eighth and fourteenth day, and 6 cases over 15 days following hemorrhage. In one case of bleeding ulcer in which perforation had occurred, the only x-ray study was a flat plate of the abdomen which showed free gas under the diaphragm. (See Chart 4.)

Twenty-five (53.2 per cent) of the 47 cases of gastric ulcer were

CHART 4

X-Ray Study in 229 Cases Bleeding Duodenal Ulcer
Time of X-Ray in Days

Days	1-7	8-21	Over 21	Total
Positive	32	36	137	205
Negative	13*	6	5	24

*3 of these re-x-rayed later and found positive.

operated upon. Others were advised to accept surgical therapy but refused. Nine (60 per cent) of the bleeding gastric ulcer cases were operated upon. Eight had subtotal gastrectomies, and one case had a closure of a perforation. Six of these patients had bled moderately, and three cases had experienced severe hemorrhages. Four had experienced bleeding on only one occasion; one patient had had two hemorrhages; and four had had three or more episodes of bleeding. None of them were operated on within 7 days of the hemorrhage. Two of the ulcers were located on the lesser curvature, one on the greater curvature, two on the posterior wall of the stomach, and four were in the prepyloric area. There was no operative mortality from bleeding gastric ulcers. Sixteen (50 per cent) of the patients with nonbleeding gastric ulcers were operated upon. A subtotal resection of the stomach was performed on 12 patients. A gastroenterostomy was done in two cases. Excision of the ulcer was the procedure in one patient, and in another case, there was only a closure of the perforation.

Of the 1188 cases of duodenal ulcers, 229 (19.2 per cent) gave a history of bleeding. Seventy-seven (34.1 per cent) of these cases had experienced hemorrhages that could be classified as severe. The erythrocyte count varied from slightly less than two million to over five million, and the hemoglobin ranged from less than 30 per cent to over 100 per cent. Three cases had less than two million red cells, and 19 cases had less than three million erythrocytes. Five cases had a hemoglobin of less than 40 per cent, two of these being less than 30 per cent.

One hundred and eight had a single hemorrhagic episode. Forty-four had experienced bleeding on two occasions, and 77 had had three or more hemorrhages. Sixteen patients received one blood transfusion, eight cases received two, and three cases received 3, and six individuals received four or more transfusions in the hospital. In addition, 28 patients had already been given blood transfusions prior to admission. Of the 229 cases of bleeding duodenal ulcer, 197 were detected by x-ray examination. Twenty-four were negative, seven cases showed roentgenologic evidence of obstruction or pylorospasm, and one case showed a questionable ulcer.

Two of the cases which showed only pylorospasm were re-examined and an ulcer was demonstrated. Seventy (31 per cent) of the 229 cases of bleeding duodenal ulcer were operated upon. Gastric resection was done in 38 instances, and gastroenterostomy was the procedure for 27 cases. Five patients were initially treated with a gastroenterostomy but continued to bleed, and gastric resections were performed later on all five cases.

Many of the 159 patients with duodenal ulcer who were not operated upon gave a history of a single hemorrhage, had had no symptoms of obstruction, and had not been on a proper medical regime. They elected to give medical management a trial. However, there were others in this group who had experienced more than one episode of bleeding and some had symptoms of partial obstruction who declined to accept surgical therapy. There were no operative deaths from bleeding duodenal ulcer. Seventy-six (7.9 per cent) of the 959 non-bleeding duodenal ulcers were operated upon. Gastric resection was performed in 22 instances. Thirty-eight patients had gastroenterostomy, and 16 had closure of perforation. Surgery was performed in these cases because 24 failed to respond to medical management, 31 had symptoms of obstruction, 20 had a perforation of the ulcer, and one was classified as a chronic perforating type of ulcer.

There were 12 patients who had ulcers of the stomach and duodenum. This amounted to approximately 1 per cent of the entire series. Four of these cases were either bleeding when admitted to the hospital or gave a history of a previous hemorrhage. Three of these had bled moderately, and one was a case that could be classified as severe hemorrhage. In addition to bleeding, one of the cases presented symptoms of obstruction. One case had bled only one time. Two cases had experienced bleeding twice, and one had three episodes of hemorrhage. Operation was performed within a week after the onset of bleeding in one case, within three weeks in another and over three weeks from the onset in two cases.

One patient had a gastroenterostomy, and later had to have a gastric resection as a result of hemorrhage from the old duodenal ulcer. Another case had only excision of the gastric ulcer followed later by gastroenterostomy. This second case which initially had a bleeding gastric ulcer and later a bleeding duodenal ulcer should have had a gastric resection. Our series of cases in which surgical treatment was carried out for bleeding duodenal and gastric ulcers is not large, but we do feel that gastric resection is the only method of treatment when it is technically possible to carry out such a procedure. All of our cases of multiple ulcers with hemorrhage were treated surgically. There was no operative mortality.

Bleeding was present in all of the five cases of marginal ulcer. All had originally had duodenal ulcers treated by gastroenterostomy. Only one had experienced bleeding prior to the gastroenterostomy. Four were eventually treated with gastric resection. The fifth case has continued to have recurrent severe hemorrhages but has not consented to gastric resection. Four of these five cases can be classified as having had severe hemorrhage, and one had a moderate degree of bleeding. In those cases classified as severe, the erythrocytes ranged from 2.43 to 2.97 million and the hemoglobin from 40 to 60 per cent. All of the cases treated by gastric resection for marginal ulcer received blood transfusions, the number varying from 2 to 4 preoperatively and 2 to 5 postoperatively in each case. One patient developed a second jejunal ulcer which perforated two months after the gastric resection, and died two days after resection of this recurrent marginal ulcer.

CHART 5

CAUSES OF DEATH

Due to Massive Upper Digestive Hemorrhage
10 Year Period—1939 through 1948 (Scott and White Hospital)

Gastric Ulcer	1
Duodenal Ulcer	1
Atrophic Gastritis	1
Blood Dyscrasia (Leukemia)	1
Gastric Varices	1
Cirrhosis	4
Total	9
Total Deaths—1939-1948 (all causes)	904

Chart 5 gives the cause of death due to upper digestive tract hemorrhage at Scott & White Hospital during the 10 year period 1939 to 1948. There were 904 deaths. It was found that only 9 of these deaths, or approximately 1 per cent of all deaths, were due to hemorrhage. Only 2 deaths in this 10 year period were found to be due to massive hemorrhage from peptic ulcer. That is, less than 3 per cent of the bleeding ulcer patients died from hemorrhage. Bohrer[6] in a review of 548 patients treated conservatively during an acute bleeding period found that bleeding gastric ulcer had a mortality of 24 per cent and bleeding duodenal ulcer 14 per cent. When gastric resections were performed during the acute bleeding period, the mortality for gastric ulcer was 23.5 per cent and for duodenal ulcer 15.4 per cent.

Chart 6 shows statistical data giving the causes of death due to massive upper digestive tract hemorrhage found by a survey of

CHART 6

CAUSES OF DEATH

Due to Massive Upper Digestive Tract Hemorrhage
(P. Brindley)

Duodenal Ulcers	2
Gastric Ulcers	3
Purpura	1
Weil's Disease	1
Carcinoma Stomach	1
Total	8

Found by Review of 1,000 Autopsies at Medical College of University of Texas.

1,000 autopsies performed at the Medical College of the University of Texas within a recent 3 year period. This material was furnished by Dr. Paul Brindley. You will observe that there were only 8 deaths accountable to hemorrhage, and there were found only 5 deaths due to bleeding ulcer in this 1,000 autopsies. Such data would seem to lend credence to the opinion that probably many of the ulcers which we see in the Southwest do not tend to be so fulminating as does a certain percentage of ulcers in the North and East. That is, the question might be raised whether we in the Southwest may not see a different type of ulcer from that seen in the northern and eastern part of the States. Many of the people there live a different type of life, for it is the industrial part of our nation. The climate certainly is not the same, and their diet probably is somewhat modified.

SUMMARY OF STATISTICAL DATA

A survey has been made of 1252 cases of peptic ulcer which were seen within a 5 year period, 1943 through 1948, at the Scott & White Clinic. Particular attention has been paid to the bleeding ulcers in this study.

Of 1252 cases of peptic ulcer, 47 were gastric, 1188 were duodenal, 12 individuals had both gastric and duodenal ulcer, and 5 ulcers were marginal.

In 47 cases of gastric ulcer seen at Scott & White Clinic, 15 (32 per cent) had hemorrhage. Nine of these bled moderately, and 6 had severe hemorrhage.

Of the 1188 cases of duodenal ulcer, 229 (19.2 per cent) gave a history of bleeding. Seventy-seven of these cases had hemorrhage which could be classified as severe.

There were 12 cases which had ulcer of the stomach and the duodenum. This amounted to approximately 1 per cent of the entire series. Three of these bled moderately and one could be classified as severe hemorrhage.

There were 5 cases of marginal ulcer. Bleeding was present in all 5 cases.

The severity of the bleeding in the entire group of bleeding ulcers was quite variable. The red cells varied from slightly over one million and 20 per cent hemoglobin to over five million and 100 per cent hemoglobin. The number of hemorrhages varied from one to four or more. The necessary transfusions varied from one to four or more. Surgery was not restricted to cases of severe bleeding.

One hundred and eighty of the 1252 cases of peptic ulcer received surgical treatment. Of these, 88 were bleeding ulcers and 92 were non-bleeding. A total of 191 surgical procedures were performed because 11 of the bleeding cases eventually had to accept further surgical treatment. There was one surgical mortality. This patient developed a second jejunal ulcer that perforated two months after gastric resection and died two days after resection of this recurrent marginal ulcer.

The patient with an acute hemorrhage is put to bed on admission, and only a limited physical examination is done. Supportive measures are instituted at once as symptoms warrant. Repeated or continuous blood transfusions are given in sufficient quantity to maintain a systolic blood pressure around 90 to 100 or more, and an endeavor is made to keep the pulse range below 110 to 120. Certainly every effort is made to prevent the patient from developing a marked degree of shock. Blood pressure and pulse readings are recorded every 30 to 60 minutes. Blood is secured for blood count, hematocrit, blood urea, prothrombin time, and for blood typing. Barbiturates and opiates are used as sedatives, and an initial dose of morphine is often indicated. It is essential that satisfactory sedation be maintained. For mild sedation, the barbiturates are preferable. Transfusions are used primarily for the treatment and prevention of shock, but also for the blood replacement.

Feeding is begun shortly following the cessation of vomiting. A fairly liberal soft diet is given including ground meat. The need for fluids, vitamins, amino acids and salts is adequately supplied. Alkaline medication such as aluminum hydroxide is usually given between feedings.

Recognition should be given to the fact that a bleeding ulcer is a more serious lesion in the older age group and that a bleeding gastric ulcer is a more dangerous condition than a similar lesion in

CHART 7

Age Incidence in 1252 Cases Peptic Ulcer (Scott & White Hospital)

Decade	*Number of Cases*	*Per Cent of Total*
2	4	0.32
3	64	5.11
4	300	23.96
5	391	31.23
6	315	25.16
7	151	12.06
8	25	2.00
9	2	0.16

the duodenum. (Chart 7.) The young patient, or one under 50, who has recovered from a massive hemorrhage may be treated on a medical regime if all other factors are favorable; however, patients in this age group who have a second hemorrhage are advised to accept surgery. Patients 50 years of age or older who have recovered from even the first severe hemorrhage should be treated surgically.

The early diagnosis of the lesions responsible for the bleeding in most instances is of secondary importance. X-ray studies are usually deferred for from seven to ten days after the hemorrhage has ceased. There is no particular hurry about having roentgenologic studies made unless it is going to modify the treatment of the case. Collins and Knowlton[7] observed that recrudescence of hemorrhage will sometimes occur following x-ray examination. In some cases of suspected gastric ulcer, x-ray examination may be indicated to determine the presence and nature of the lesion. It has been our observation that the roentgenologist will fail to demonstrate the acute bleeding ulcers more often than any other type. The ulcer which bleeds is often a small penetrating type of lesion. There is edema around its margins which narrows the entrance into the ulcer crater. The crater may be filled with fibrin or blood clot, and the physical status of the patient will not permit proper palpation and manipulation of the stomach. Dr. C. A. Stevenson of the X-Ray Department at Scott & White gives the following reasons why the radiologist sometimes fails to demonstrate the source of bleeding: Small varices, shallow ulcer of the esophagus, diaphragmatic hernia with ulcer, gastritis, small gastric ulcer, ulcer filled with clot or fibrin, and ulcer below the duodenal cap.

Peptic ulcer is primarily a medical problem. Surgery is advised for acute perforated ulcer, for the obstructing type lesion, and for the ulcer complicated by massive hemorrhage. A gastric ulcer must be carefully evaluated, and it is believed that surgery is indicated

for a majority of these. Gastric ulcers in the older age group, those complicated by bleeding, and all large gastric ulcers should be treated surgically. Almost all acute bleeding peptic ulcers are handled with what may be termed conservative care, that is, medical management or non-surgical therapy. In this series of 1252 cases, no patient was operated upon during the acute phase of bleeding. There were only two deaths in this group that could be attributed to hemorrhage from the ulcer.

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STRICTURE OF THE COMMON BILE DUCT: ETIOLOGY AND TREATMENT

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STRICTURE of the common bile duct is generally regarded as one of the most difficult problems encountered by the abdominal surgeon. The successful management of this lesion often requires a combination of judgment, technical skill, ingenuity, and experience beyond that necessary for the successful management of many intra-abdominal abnormalities. Because of the gravity of the problem all who are concerned with surgery of the biliary system should devote special care to the prevention of this condition and also be familiar with the methods for correction of this lesion.

ETIOLOGY OF BENIGN STRICTURE OF THE COMMON BILE DUCT

Benign strictures of the common bile duct result rarely from inflammation in or about the duct. Much more frequently stricture of the common duct is the sequel to cholecystectomy. In an editorial discussing the problem Cole states that at the University of Illinois Research Hospital stricture of the common bile duct was preceded by biliary tract surgery in 75 per cent of the cases.[1] Cole quotes figures by Cattell as showing an 80 per cent relationship between benign strictures and previous gallbladder surgery and quotes Walters as giving a 90 per cent relationship. From these figures it is readily apparent that the general conception of the relationship of benign stricture to surgery is adequately supported by numerous studies.

In some instances where gallstones have resided in the common bile duct for a prolonged period of time, a severe inflammatory reaction has occurred about such stones. This inflammatory reaction may lead to a destruction of the mucosa of the duct and the resulting fibrosis may produce a stricture of the common bile duct. It is also true that a stone impacted near the ampulla of Vater associated with long-standing inflammation in this region may be followed by a fibrosis in the region which produces literally a stricture of the ampulla. Cases of stricture of the common bile duct have been reported following extensive inflammatory reaction which may be associated with duodenal ulcer. As mentioned above, it is generally agreed that stricture may follow inflammation in and

*From the Department of Surgery of the University of Tennessee, Memphis.

about the common duct. However, most cases do not owe their origin to the presence of inflammation.

Stricture of the Common Bile Duct Resulting from Operative Trauma

The majority of patients suffering from stricture of the common bile duct give a history of having previously undergone cholecystectomy. A review of the initial operative record frequently reveals that at some time during the course of operation troublesome hemorrhage was encountered. In many instances of common duct injury the accident occurred when the operator sought to control hemorrhage by clamping or suturing structures which could not be clearly identified due to the presence of the uncontrolled hemorrhage. In such instances the common duct has been either partially or wholly included in a ligature.

In some instances the common duct has been injured because of the difficulty experienced by the operator in clearly identifying the junction of the cystic and common duct. When a severe inflammatory reaction is present about the biliary structures accurate identification of the ducts is much more difficult. It is also recognized that a very large number of anomalies of the duct system occur. The chance of injuring important structures is greatly decreased if one demonstrates in every case where the cystic and common duct actually join rather than to presume the anatomy is normal.

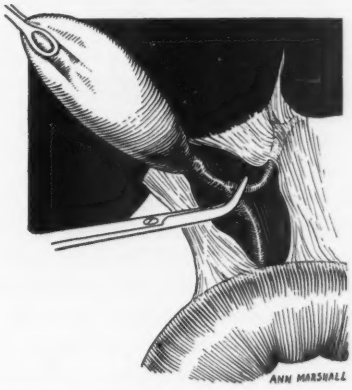

Fig. 1. Drawing illustrates how traction on the gallbladder during cholecystectomy may result in "tenting" of the common bile duct. In such instances the common duct may be inadvertently clamped.

In some cases where the bile duct has been injured the operative record reveals that the initial operation was believed to be a very

easy one. In such cases the duct has usually been injured by the application of the clamp to the "tented" common duct. With traction on the gallbladder the common duct is actually brought up into the region of the cystic duct and is clamped without the knowledge of the operator.

Prevention of Strictures of the Common Bile Duct

Since biliary tract strictures may be the result of inflammatory processes which are allowed to persist for a long period of time it obviously becomes our duty to insist that such conditions be adequately treated without being allowed to persist for long intervals.

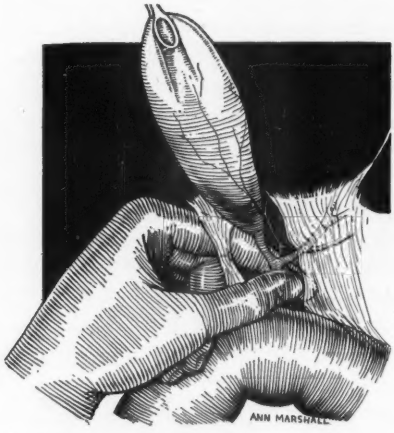

Fig. 2. Severe hemorrhage from the divided cystic artery can usually be controlled by compressing the hepatic artery between the thumb and index finger. The index finger is placed within the foramen of Winslow. After the field is rendered dry the bleeding point may be identified and ligated.

Perhaps the best way to decrease the incidence of strictures of the common duct is to afford better training for all surgeons who will perform surgery of the biliary tract. A familiarity with the normal as well as the anomalous situations which may be encountered is necessary if this distressing complication is to be eliminated during the course of routine cholecystectomy. Experienced surgeons have frequently called attention to the necessity for adequate exposure, excellent lighting of the operative field, and adequate anesthesia. Without the adjuncts of good light, adequate anesthesia, and good retraction even the experienced surgeon may find it impossible to operate with safety in this region. Experienced surgeons have also frequently called attention to the necessity of clamping only the bleeding point in cases where hemorrhage occurs obscuring the

operative field. The operator or the first assistant by inserting the index finger into the foramen of Winslow can usually satisfactorily compress the hepatic artery between the thumb and index finger. This temporarily controls the bleeding and allows the surgeon to secure a dry field and to visualize the bleeding point. The careful use of this maneuver may make the difference between a permanently damaged common bile duct and a normal structure. It has frequently been pointed out that in certain cases where the normal relationships are obscured by a marked inflammatory reaction the operation may be more safely performed by removing the gallbladder from above downward. In general this procedure is associated with more bleeding from the liver bed. However, in certain instances this is the safest way to perform cholecystectomy.

Methods Used for Repair of Common Duct Strictures

The fact that so many different methods have been suggested for the repair of stricture of the common duct bears evidence of the fact that no one method is applicable to all cases because of the variation in the site and type of injury which may occur to the duct. The older methods used for the repair of common duct stricture have all been variations of two general principles.[2] The first principle is that of end to end suture of the common duct in instances where such treatment is applicable. The second method which has been used in many cases consists of some variation of the general principle of suturing the proximal end of the duct into some portion of the gastrointestinal tract. In some instances the proximal portion of the duct is sutured to the stomach and in other cases to the duodenum or jejunum. Another variation of this principle was the method of dissecting out an external biliary fistula and implanting the fistula into the stomach or small bowel. It is not surprising that since this tract was made up of fibrous tissue to a large extent, fibrosis proceeded to the point of stricture in most of these cases. A third method of dealing with certain especially difficult strictures of the common duct, particularly those where almost no remnant of the duct remained, was introduced recently by Longmire.[3] This procedure consists of resecting a portion of the left lobe of the liver, identifying the left intrahepatic bile duct and performing an anastomosis between this duct and the jejunum. This method which was first reported by Longmire has since been reported upon by Wilson[4] and by Sanders.[5]

When feasible the most satisfactory repair of a common duct stricture consists of excision of the stenosed area and end to end anastomosis of the duct. It is also generally agreed that such a repair should usually be carried out over some supporting structure

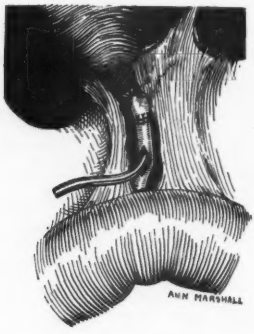

Fig. 3. Illustration of end to end suture of common duct after excision of the stenosed area. Catheter or T tube is usually brought out via an opening in the duct either below or above the site of repair.

such as a catheter or rubber tube. In previous years the repair of the bile duct over a vitallium tube was looked upon with favor; however, more recent experience has shown that vitallium offers no advantage over a rubber tube and perhaps is less desirable. Many surgeons interested in this field have emphasized the value of bringing the catheter or T tube to the outside through an opening in the common duct either above or below the point where the anastomosis was performed.[2] Unfortunately, in many cases it is impossible to identify both ends of the duct or to bring these structures together. Cattell[2] and Lahey[6] have emphasized the value of reflecting the duodenum medially so as to expose the retroduodenal portion of the distal common duct. Indeed, in some cases these authors have described operations in which they demonstrated the distal end of the duct by splitting the head of the pancreas and by such dissection bringing the distal portion of the duct into view.

The second general principle mentioned above, namely that of the implantation of the proximal end of a strictured duct into some portion of the intestinal tract either the stomach, duodenum, or jejunum, has been the method used, with variations, more than any other. When feasible the proximal end of the duct may be implanted into the duodenum. Allen[7] popularized the use of the Roux Y limb of jejunum for anastomosis to the proximal end of the common duct. This was performed because it was felt that it would be followed by a decrease in the incidence of ascending infection. It is well known that when the sphincter of Oddi is by-passed, ascending infection is likely to become an important problem. In our experience the use of the Roux Y is a more satisfactory procedure than is choledochojejunostomy. It should be emphasized that regardless

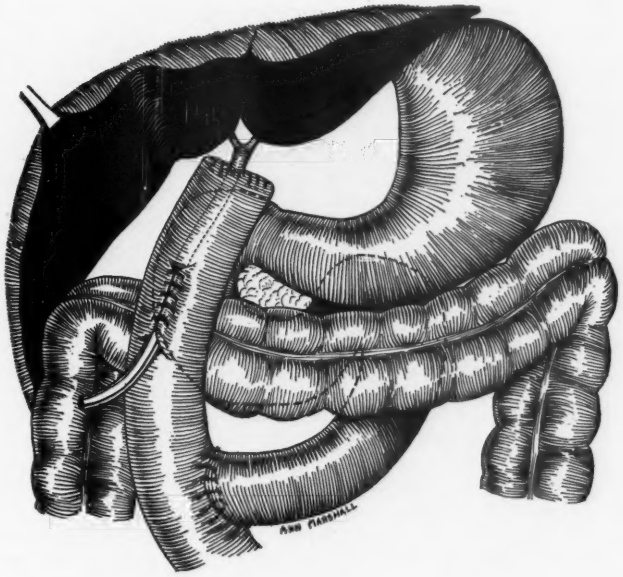

Fig. 4. Drawing demonstrates the use of the Roux Y loop of jejunum for anastomosis with the proximal end of the common bile duct as popularized by Allen. End to end anastomosis between duct and jejunum performed over catheter. Catheter is brought out of the bowel by the Witzel method.

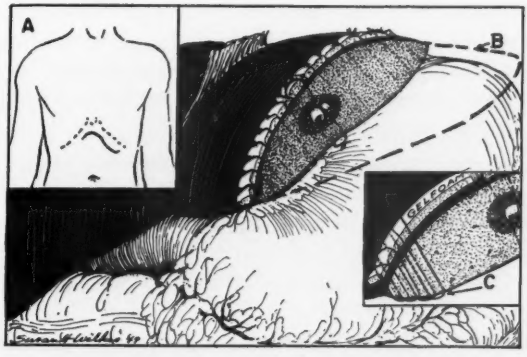

Fig. 5. Inset left upper quadrant of drawing illustrates type of subcostal incision used in performing intrahepatic cholangiojejunostomy. Large drawing demonstrates left lobe of the liver after partial resection has been accomplished. Note the use of overlapping mattress sutures, tied over a strip of gelfoam, to control bleeding from the cut liver surface. Left intrahepatic bile duct is visualized being accompanied by a small artery which has been ligated. A small amount of liver substance adjacent to the duct has been removed with the curette.

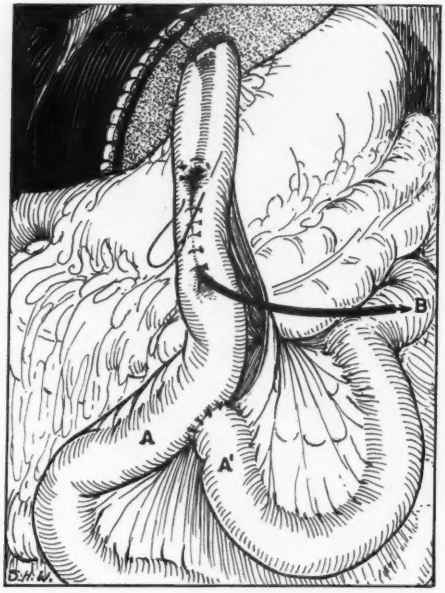

Fig. 6. End to end anastomosis is performed between the intrahepatic bile duct of the left lobe of the liver and a Roux Y limb of jejunum. A mucosa to mucosa union is accomplished over a catheter utilizing interrupted sutures. The catheter is brought outside by the Witzel method and is removed after 10 to 14 days.

of the method it is important to secure an accurate anastomosis of mucosa of the duct to mucosa of the intestinal tract. It is also our feeing that in general it is best to perform such anastomoses over some type of catheter, such a catheter being brought to the outside by an appropriate method so that it may be removed when desired.

Our experience with the Longmire procedure was reported in a previous communication. This will be briefly reviewed.

Case Report

A 40 year old white male entered the hospital on our service in January, 1948. The chief complaint was that of jaundice accompanied by recurrent fever associated with severe chills.

Past history revealed that 16 months prior to admission he had undergone cholecystectomy. He was told that the gallbladder contained many stones. Following operation his course was uneventful except for an unusually profuse drainage of bile from the wound which persisted for several days. After his original operation the patient began to experience recurrent attacks of jaundice which varied in intensity. On March 21, 1947, he underwent an exploratory laparotomy and was told that no obstruction was found in the bile duct. However, he was not improved by this operation. When the patient entered

the hospital on our service he was markedly jaundiced, the stools were clay-colored, there had been a loss of 40 pounds of weight, and the patient complained of tenderness beneath the right costal margin. On Feb. 3, 1948, an exploratory laparotomy was performed and no definite common bile duct could be identified. An area in the hilus of the liver was entered from which bile could be seen to issue. This area was anastomosed to the duodenum. Following this procedure the patient was not improved and it was supposed that the newly established communication never adequately functioned. On March 13, we elected to carry out the Longmire procedure. A modified V type incision was made beneath the costal margin. The triangular ligament supporting the left lobe of the liver was divided and the left lobe of the liver was delivered into the wound. Mattress sutures were placed through the left lobe of the liver in such a manner as to control bleeding and the lateral two thirds of the lobe was cut away with a sharp knife. A small bile duct, large enough to allow it to be catheterized with a No. 14 French catheter, was identified in the mid-portion of the left lobe of the liver. Liver tissue immediately adjacent to this duct was curetted away. A Roux Y loop of jejunum was utilized in making an end to end anastomosis between the jejunum and the bile duct. The catheter was brought out of the Roux Y limb by the Witzel procedure. The liver tissue which was removed at operation revealed the presence of a rather diffuse hepatitis. This is not surprising in view of the long-standing biliary tract infection from which the patient suffered. The course immediately following operation was characterized by fever and some drainage from the abdominal wound. A partial wound disruption required secondary closure twelve days after the Longmire procedure was carried out. Bile appeared in the stool on the third postoperative day and has continued to be present. The patient's general condition has gradually improved and he has gained approximately 20 pounds in weight. He has returned to his normal occupation and the serum bilirubin curve has returned to approximately normal. The jaundice has disappeared.

Everyone who has had experience in the surgical correction of strictures of the common duct emphasizes the fact that it is impossible to state whether or not a patient is permanently cured until a very long period of time has elapsed. The reason for this, of course, is that in many instances another stricture develops at the site of repair. Because of this fact it is necessary to be very guarded in our prognosis regarding a given case. Nevertheless, these individuals will certainly die unless they are given the benefit of adequate surgery. Therefore, it behooves all interested in abdominal surgery to familiarize themselves with the best methods available for the management of these most difficult problems.

Summary and Conclusion

1. Benign strictures of the common bile duct occasionally result from inflammatory processes in or about the common duct.

2. The majority of benign strictures of the common duct are the result of trauma.

3. The importance of the prevention of stricture of the common duct has been emphasized.

4. Methods of repair of common duct strictures have been outlined and a brief report given of a case which was treated by partial hepatectomy and intrahepatic cholangiojejunostomy.

5. Regardless of the type of treatment used in reestablishing continuity of the biliary tract such patients are always subject to the possibility of a recurrent stricture over a period of years.

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INTRAMEDULLARY NAILING OF FRACTURES OF THE SHAFT OF THE FEMUR

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ANY method of treating fractures of the shaft of the femur which will supplant the use of plaster immobilization, plates and screws and skeletal traction is worthy of the closest consideration.

For fractures of the femur a body cast is neither comfortable nor efficient and its use often results in muscle wasting and joint stiffness in regions far from the actual fracture site.

The objection to plates and screws is that the plate holds the fractured ends rigidly apart, creating a gap over which callus must cross before union can take place. The Egger plate with its sliding longitudinal action eliminates to some extent this objection. However, the use of plates and screws must be supplemented by a cast.

With skeletal traction there is the ever present danger of distraction leading to nonunion, and constant observation is necessary to keep the apparatus in alignment and the patient comfortable.

The earliest record of intramedullary pinning of a long bone, the clavicle, is credited to Lambotte in 1902, using a longitudinal screw and later a carpenter's nail. Joly, using Kirschner wires, has advocated axial transfixion of the small long bones since 1935. In November, 1937, Dr. Leslie Rush of Meridian, Miss., in the American Journal of Surgery reported a Monteggia fracture treated by intramedullary pinning of the ulna with a Steinman pin. Again in July, 1939, in the Journal of Bone and Joint Surgery, he reported a subtrochanteric fracture of the femur treated with an intramedullary type pin. In 1939 Dr. Hugh Gamble, of Greenville, Miss., advocated the use of an elongated narrow Smith-Petersen type nail for use in fractures of the upper third of the humerus, driving the nail from above downward at the region of the greater tuberosity of the humerus.

In 1940, Kuntscher, a German surgeon, introduced his method of inserting a steel rod through the top of the greater trochanter and extending it down the medullary canal to the lower femoral epiphysis. Dr. Lorenz Bohler has written a text, "The Medullary Nailing of Kuntscher," which contains most of the literature on this subject abroad. The text is generously illustrated and filled

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with numerous case reports. It is recommended to all interested in this subject but should not be followed too closely as there are phases of medullary nailing open to argument. Robert Souer of Brussels, Belgium, reported in the April, 1946, Journal of Bone and Joint Surgery his experiences with medullary nailing in 23 cases of fracture of the femur. He used both the open and closed methods of reduction. He reports excellent results with medullary nailing of simple fractures and poor results in three compound fractures. In the October, 1947, Archives of Surgery, Dr. Dana Street, of Memphis, reported 3 cases of fracture of the femur treated by open reduction and medullary nailing with excellent results.

In Annals of Surgery (April, 1948) Westerborn of Gothenburg, Sweden, reported 100 fractures of long bones treated from 1943 to 1948 with medullary nailing, but he did not specify the number of femurs treated. He used both the open and closed methods of treatment. He reported excellent results and is most enthusiastic concerning medullary nailing—particularly with regard to fractures of the femur.

There are three types of femur nails with which we are familiar: (1) the Kuntscher clover-leaf hollow nail, (2) the Hansen-Street solid diamond-shaped nail, and (3) the smaller round Rush nail. We have used both the Kuntscher and Hansen-Street nails and find them comparable in all respects. We have had no personal experience with the Rush nail, as this nail is not yet on the market. The Kuntscher and Hansen-Street nails are in reality large rigid rods while the Rush nail is round, smaller in diameter, more flexible, and depends for its stability on a spring principle.

For the first time with the use of medullary nailing, we have the muscles working with us instead of against us. The more the muscles contract the closer the fractured fragments are impacted, assuring continuous compression of the bone ends. The importance of this factor should be emphasized, remembering that the thigh muscles are the most powerful group of muscles in the human body. Drs. Eggers, Schnider and Pomerat of Galveston, Texas, presented at the American Academy of Orthopedic Surgeons, at Chicago, in January, 1949, some convincing experimental evidence of the importance of this principle. Another example is the walking cast, a proved method of treatment which again demonstrates the importance of continuous impaction of fractured fragments in obtaining union.

No external support following operation is usually necessary. Thus the patients are immeasurably more comfortable than if treated by any other method. Morale is much higher. They can move about immediately and are out of bed in a wheel chair within

a week, are soon on crutches and out of the hospital. With exercise muscles quickly regain their tone and joints their normal range of motion. This is of particular importance in the elderly who are prone to develop stiff joints if immobilized for any length of time. Exercise prevents decalcification of the bones from inactivity and the patient's general condition is benefited by being up and about. Pneumonia is less to be feared. Pressure sores from a cast are avoided. With exercise the danger of postoperative phlebitis and embolism is lessened; and finally, the patient's hospital bill is cut to a minimum.

Kuntscher's original method of blind nailing following closed reduction is not recommended. It is not practical with comminution and displacement. What is recommended is an open reduction with introduction of a medullary nail under direct vision by the retrograde method. This is a less shocking procedure than open reduction with plating. It can be accomplished in less time, and the exposure need not be as long. If medullary nailing is indicated and properly executed there is no need to fear operative shock.

Theoretically fat embolism is a danger. Kuntscher has reviewed hundreds of cases minimizing this possibility. In adults the bone marrow is not highly differentiated and regenerates rapidly. It is mainly fat serving as mechanical filling of dead space. In all probability there is some degree of fat embolism with every medullary nailing but in amounts too small to produce symptoms. In a review of the literature, mostly from Europe, 8 deaths have been reported as resulting from fat embolism. Each of these followed the closed nailing technic. An advantage of the open method is that fat can be washed out of the wound with normal saline or, preferably, ether. Granted that fat embolism is a theoretic danger, with the use of the open method it does not seem to be a practical one. Migration of the nail has been listed as a possible complication. If the nail is long enough to begin with and of the proper width there is little danger of migration in the treatment of fresh fractures. This also holds true for rotation of the fractured fragments upon each other, and for angulation and lateral displacement. There is no excuse for putting in a nail that is too long. With the use of either the Hansen-Street, Kuntscher, or Rush nail there is no danger of corrosion from the metal. If weight-bearing is not allowed until there is x-ray evidence of union and the dictates of common sense are followed by the patient, there is no reason to fear fracture of the nail. With obese patients and early weight-bearing there is danger of lateral bending of the nail and posterior angulation at the fracture. One must depend on radiologic rather than on clinical evidence of union

as the criterion for allowing weight-bearing. This is particularly true with the oblique and comminuted type fracture.

With open medullary nailing the nail travels directly in the medullary cavity at all times so splitting of the bone does not occur. If the nail is too thick it may become wedged and fine cracks may appear in the bone, but it will not split. Splitting of the bone may follow the closed reduction method of Kuntscher if the nail is inserted on the outside of the greater trochanter and driven into the medullary cavity from the side instead of from above.

Open reduction with medullary nailing of necessity slows down endosteal callus formation, as does any type of open reduction, particularly if the nail is large and wedged tightly in the medullary canal. The larger the diameter of the nail the more likelihood of destruction of endosteal bone from pressure. A smaller diameter nail would be preferable from the standpoint of endosteal union. On the other hand the nail should practically fill the cavity in order to achieve maximum stability without external support, and to prevent displacement, angulation and torque. The optimum diameter of the medullary nail is still an open question. The smaller diameter nail of Dr. Leslie Rush with its three point pressure, or some similar modification of greater tensile strength may be the answer. Time and further investigation will undoubtedly lead to the development of better technics. However, this method will compare favorably with any present method of open reduction regarding early union. The medullary nail seems to stimulate an early formation of periosteal or soft callus, possibly by periosteal irritation.

The indications and contraindications for medullary nailing by open reduction are fairly definite. The indications are:

(1) Transverse and oblique simple fractures of the shaft of the femur from two inches below the lesser trochanter to four inches above the lower femoral epiphyseal line.

(2) Spiral comminuted or fragmented multiple simple fractures in the same region if the medullary nail is supplemented by wire loops or skeletal traction. It is our belief that the use of casts is not necessary. Wire loops will usually suffice. On occasion heavy catgut loops are used and at times supplementary screws. Postoperative elevation of the leg and thigh in a Thomas splint with a Pierson attachment is helpful in the more severe cases. To prevent shortening skeletal traction is occasionally indicated in multiple fragmented cases that cannot be handled with wire loops or screws, and for fractures immediately adjacent to the trochanter to prevent the development of a coxa vara deformity; 5 Kg. is sufficient traction

weight. With skeletal traction frequent x-ray check-ups are advised as distraction can occur as well as shortening.

(3) Compound fractures not grossly contaminated and with minimal soft tissue damage if treated early and treatment supplemented by antibiotics.

(4) Old fractures of femur with delayed union or nonunion due to distraction. Also malunited fractures with shortening, angulation or rotary displacement. With marked shortening preliminary osteotomy and gradual stretching by skeletal traction is indicated prior to medullary nailing.

(5) Pathologic fractures resulting from osteitis fibrosa cystica are particularly suited as are metastatic carcinomas with fracture.

(6) In pseudarthrosis medullary nailing can be used to advantage, usually combined with some type of bone grafting procedure.

Contraindications:

(1) A poor surgical risk from any cause. These are potential candidates for shock and patients in shock will not stand pounding with a mallet. Shock also markedly increases the danger from fat embolism.

(2) All fractures less than two inches from the lesser trochanter or less than four inches from the lower femoral epiphyseal line. A single rigid nail cannot get enough grasp in this short fragment to achieve stability. It is interesting to note that Dr. Leslie Rush recently reported a supracondylar fracture successfully treated by double nail fixation passing the nails from below upwards through small, medial and lateral incisions over the femoral condyles. This technic may well prove a valuable addition to the present technic of medullary nailing, and can be accomplished only with the use of the more flexible Rush nail.

(3) Fractures in bone diseases where the medullary canal is blocked. This happens in some cases of Paget's disease. In others, according to Kuntscher, where the bone is not severely bowed and the medullary canal is not blocked medullary nailing is particularly suited. In Paget's disease the bone is hard and brittle and will not accommodate plates and screws as well as a normal bone.

(4) Patients under 15 years of age. Here the danger of acute osteomyelitis is greatly increased as compared to adult bone. Fractures in children are best treated by closed reduction methods. Other contraindications are:

(5) Operation in the presence of gross swelling and fever.

(6) Grossly contaminated compound fractures, and finally,

(7) Infectious or potentially infectious condition of the skin of the thigh, as furuncles, abrasions, burns and blebs.

When contemplating the use of medullary nailing a thorough x-ray study of the length, width, and direction of the medullary cavity is essential. For length measurements we use the opposite femur after verifying that the extremities were the same length prior to injury. A nail of approximate length is strapped directly to the thigh at the level of the bone and an anteroposterior x-ray is taken. From this a nail of the right length can be determined. The tendency is to err on the short side. The nail should reach from just above the tip of the greater trochanter to just above the lower femoral epiphyseal line. In most instances this line can be readily demonstrated on an anteroposterior x-ray. Films of the injured femur are taken also, both anteroposterior and lateral views, and these are studied as to the width of the canal throughout and for any abnormal bowing or angulation of the shaft. The medullary canal is narrowest at the isthmus which is just proximal to the middle of the shaft. A nail of a width smaller than the canal at its narrowest point is selected. The width of the medullary cavity differs markedly in individuals of the same build and height, and seems to be an individual matter. Care in selection of the correctly sized nail as to width and length is emphasized to avoid complications that otherwise are sure to follow.

Medullary nailing is not an emergency procedure. On admission the patient with a simple fracture of the femur is put in a Thomas splint with a Pierson attachment and the leg elevated. Operation is routinely deferred for four or five days or longer. Shock, if present, is treated. Blood transfusions, if necessary, are given and donors are also made available at operation. The patient's heart and kidneys are checked. Time is allowed for gross swelling to recede. Penicillin is given as a prophylactic measure both preoperatively and postoperatively. At operation it is helpful if the injured leg is adducted, internally rotated, and the opposite leg abducted. This places the greater trochanter in a more prominent position and facilitates the operation. The patient can also be placed on his well side and the injured hip flexed to 100 degrees at the knee. Again, this places the greater trochanter in a more advantageous position.

Simple transverse fractures of the mid-third of the femur are ideal for medullary nailing. The incision of Henry is used, going between the quadriceps and vastus lateralis muscles and splitting the vastus intermedius to expose the fracture. The posterolateral incision of Campbell may also be used, going between the tensor fascia femoris and vastus lateralis and reflecting the vastus lateralis medially. This incision has the advantage that should the fracture

become infected the stitches can be removed and dependent drainage readily established.

We have used medullary nailing as well in treating early compound fractures. The wound of incision is usually closed, but in case of doubt as to enough soft tissue damage to fear infection the wound is left open and packed, with secondary closure at a later date. The compound wound itself is not sutured in any case.

Postoperatively, exercises are encouraged to the limits of pain. Quadriceps and ankle exercises are begun on the second postoperative day and after one week, knee bending, hip bending, and straight leg raising exercises are given. By this time the patients are allowed up in a wheel chair. After 2 to 3 weeks, when the operative wound is completely healed, the patients are allowed up on crutches without weight-bearing and are discharged from the hospital. At 6 to 8 weeks partial weight-bearing on crutches is usually allowed. The crutches are discarded and full weight-bearing is allowed when there is x-ray evidence of union, usually in 10 to 14 weeks.

The medullary nail is left in for at least 6 months or longer, depending on x-ray evidence of solid union. Do not be in a hurry to remove the nail. After 6 months the nail is somewhat loosened and comes out easily. A small incision over the greater trochanter and a special retractor is used to remove the nail. The patients should be kept in bed for 3 to 4 days, after which they can be up and about.

Since June, 1948, we have treated 9 simple and 2 compound fractures of the femur with medullary nailing, using both the Kuntscher and Hansen-Street nails. All cases in this small series were treated by open reduction in a retrograde manner. They represent all types of fractures from simple transverse to multiple, comminuted, and compound. Seven of these fractures, 6 simple and 1 compound, progressed rapidly to union, clinically and by x-ray, within 3 months with full weight-bearing without crutches, with an excellent range of joint motion, and with no appreciable muscle atrophy.

One patient with a severe compound multiple fracture was allowed up on crutches without weight-bearing only after 3 months. Films in this case, 4 weeks following surgery, showed osteoporosis of the cortex of the proximal fragment without any significant periosteal reaction. This was thought to be due to atrophy secondary to vascular impairment as after 3 months a hematoma was evacuated from the upper thigh by incision and drainage. He showed no callus formation at 8 weeks but did show good callus formation at 12 weeks at the distal fracture site and slight callus formation at the proximal fracture. Recent films at 20 weeks show increased callus

production at both fracture sites and an eventful union seems assured. Three additional cases are quite recent.

In the remaining cases there have been no infection, no deaths, no nonunions, no postoperative phlebitis, embolism, or other major complications either with the nail or the patient. The nail has been removed in three instances after 6 to 7 months.

Dr. Leslie Rush, a pioneer in this field, has treated 25 fractures of the femur in the past 3 years with medullary nailing, using the open method and his own nail, with no infection, nonunion, postoperative embolism or phlebitis, and no bone damage from the use of his pin. His pin is passed from above downwards, not by the retrograde method.

Dr. Dana Street, one of the originators of the Hansen-Street nail, has treated in the past 3 years 32 fractures of the femur by both closed and open retrograde method. He reports no deaths, one infection, no nonunions, no embolism or phlebitis. He favors the closed method in the more simple type cases, where reduction can be more easily accomplished.

Dr. Don Imrie, of Vicksburg, Miss., in the past year has treated 4 fractures of the femur using the Hansen-Street nail and the open method of treatment—but passing the nail from above downwards. He reports excellent results in 3 cases, the fourth patient having died as a result of a severe head injury and not from medullary nailing.

In the past year Dr. Tom Robertson, at the Veterans Hospital, Jackson, Miss., reports 4 simple fractures of the femur treated by open medullary nailing, using the Hansen-Street nail, passing the nail from above downwards, with one death in an elderly male with multiple fractures of femur and both tibias. Another of his patients fell 4 weeks postoperatively, bending the nail to a thirty degree angle. This was readily corrected by manual manipulation under anesthesia. A third patient developed a nonfatal pulmonary embolism on the second postoperative day. This case was a fresh fracture.

The total number of cases reported is 76 with 2 deaths, one infection, one nonfatal pulmonary embolism and no postoperative phlebitis. No nonunions are reported. A few cases are quite recent and are still under observation.

Medullary nailing as compared to other methods has the following advantages: (1) Patients more comfortable than if treated by any other method. (2) No external support usually necessary. (3) Early ambulation possible. (4) Hospital time and expense mark-

edly decreased. (5) Joint stiffness, muscle atrophy, bone decalcification, postoperative phlebitis and embolism minimized, and lastly (6) Constant impaction and approximation of the fractured fragments made possible by muscle contraction.

Medullary nailing by the closed method of Kuntscher is not recommended. The retrograde open method of medullary nailing is recommended for practically all simple and for some early compound fractures from two inches below the lesser trochanter to four inches above the lower femoral epiphyseal line. The importance of selecting the proper size and width nail for each case is emphasized. The danger of too early weight-bearing, especially in heavy individuals, is stressed and x-ray rather than clinical evidence of union is emphasized as the criterion for allowing weight-bearing.

It is the belief of the writer that in properly selected cases medullary nailing is the best method, offering a distinct advance over previous methods of treating fractures of the shaft of the femur.

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SARCOMA OF THE RECTUM

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THE purpose of this paper is twofold: to present a brief review from the literature of the universal features of sarcoma of the rectum and to record an additional case report of this relatively rare lesion.

Incidence: The reports of various authors indicate that approximately one out of every 200 rectal malignancies is of a sarcomatous nature. Dukes and Bussey[1] found 8 cases of sarcoma of the rectum out of 2,200 operative specimens of rectal malignancies examined over an 18 year period at the St. Mark's Hospital. Thus in their series, rectal sarcoma constituted approximately 0.5 per cent of rectal malignancies. In 1927 Weeks[2] reviewed 100 cases of sarcoma of the rectum. He regarded many of these as doubtful cases and stated "If the questionable cases were discarded, it is certain that the number would be reduced by one-half." Since that time 59 cases of rectal sarcoma have been reported in the literature. Other authors including Sutton,[3] Kallet and Saltzstein,[4] and Goldman and Marbury[5] have emphasized the infrequency of this lesion. Primary sarcoma of the rectum is also infrequent as compared to sarcoma in other parts of the body. The authors were especially impressed by the rarity of the lesion when a review of the records at the teaching hospital of the University of Tennessee, a 500 bed institution, failed to reveal any other case of sarcoma of the rectum in the past 15 years.

Symptomatology: There is no characteristic or distinctive symptomatology of sarcoma of the rectum. The symptoms are usually most indefinite. In general the symptoms are much the same as those for carcinoma of the rectum: that is, rectal bleeding, cachexia, loss of weight, progressive weakness and a feeling of fullness or discomfort in the rectum. The patient may complain of diarrhea or constipation or more often will give a history of change in bowel habits. In comparing sarcoma with carcinoma of the rectum Bacon[6] states that the pain with a sarcoma of the rectum occurs earlier and is much more severe than with a carcinoma. He further points out that according to the location of the growth, the pain may be referred to the bladder, sacrum or thigh. An occasional tumor of this type may be seen to protrude from the anal orifice especially after defecation and the patient may present himself complaining of a

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tumor which he has discovered while having a bowel movement. As is the case with carcinoma of the rectum, sarcoma eventually becomes ulcerated, giving rise to bleeding, symptoms of marked irritation, and the passage of mucus and pus along with the blood.

Physical Signs: Buie[7] has emphasized the difficulty in diagnosis in his writing on sarcoma of the rectum by reporting on 12 cases, pointing out that in none of the 12 cases was a positive diagnosis of sarcoma made from the gross appearance of the process at proctoscopy. He chose to show the confusion existing in the mind of the examiner by quoting the proctoscopic report prepared on the occasion of each examination. In reading these reports one is impressed with the fact that in the majority of instances the lesion was interpreted as being malignant, but the examiner thought the lesion was carcinoma. This further emphasizes the fact that the gross appearance rarely leads one to suspect a sarcoma. Digital examination may reveal the presence of one or more tumors which vary in appearance and consistency depending upon the stage of the disease. These tumors usually arise from the submucosa but may have their origin in the muscularis. They vary markedly in size and shape and show no predilection for either the anterior or posterior wall of the rectum. In the beginning the tumor usually appears as a small nodule under the mucosa with an intact, movable, overlying mucosa and at this stage one might suspect the lesion to be a sarcoma. As the tumor increases in size it invades the mucosa and eventually ulceration and secondary infection occur. After ulceration occurs this lesion cannot be distinguished on local examination from carcinoma. As indicated above an occasional sarcoma of the rectum may have the characteristics of a polyp and may prolapse through the anal orifice after defecation.

Diagnosis: In order to re-emphasize the importance of biopsy in the diagnosis of sarcoma of the rectum we quote Buie[7] as follows: "If there is one fact which speaks loudly in favor of taking specimens for microscopic examination in the course of proctoscopy, it is the impossibility of diagnosing sarcoma in any other manner." The same general points always to be borne in mind in studying and examining a patient suspected of having a carcinoma of the rectum should also be applied in sarcoma of the rectum: that is, a careful history and physical examination, including digital examination of the rectum, proctoscopic examination, and biopsy of any suspicious lesion. It is beyond the scope of this presentation to enter into a lengthy discussion of the pathology of sarcoma of the rectum but it might be well to mention very briefly the gross characteristics of sarcoma and to list the histologic types which we consider important. Grossly, sarcoma is described as being rather soft, greyish

white, and resembling brain tissue. This is in contrast to carcinoma of the rectum which is described as being hard, yellowish white in color, and having a slightly granular appearance on the cut surface. Various histologic classifications are given but we prefer the simple classification applicable to sarcomatous lesions in most parts of the body as follows:

I. Lymphosarcoma.
   (a) Malignant lymphocytoma.
   (b) Recticulum cell sarcoma or large round cell lymphosarcoma.

II. Spindle cell sarcoma.
   (a) Fibrosarcoma.
   (b) Neurogenic sarcoma.
   (c) Myosarcoma, usually leiomyosarcoma.

We have not included malignant melanoma in this study because it is not generally thought that pigmented tumors are of connective tissue origin.

Differential Diagnosis: There are several lesions which should be differentiated from sarcoma of the rectum. The most important of these are neoplastic lesions including benign adenomas of the rectum but there are other entities requiring differentiation such as hemorrhoids, gumma, actinomycosis, and certain chemical tumors. The distinguishing features of these various lesions are well presented by Bacon.[6]

Prognosis: There is considerable difference of opinion expressed in the literature regarding the prognosis of these tumors. Bacon[6] states "Due to early and rapid metastasis, the tendency to recurrence and the early age at which it occurs, sarcoma presents an exceedingly grave prognosis; in fact, the termination is fatal." Dukes and Bussey[1] enter into a little more detailed discussion of the subject and consider the various histologic types of rectal sarcoma under different headings. They are of the opinion that it is probable that patients with lymphosarcoma of the rectum who are treated by a combined excision operation have a relatively good prognosis. They call attention to the fact that their four patients with this disease are all alive and well, one 5 years, one 4 years, and one 3 years and 4 months after rectal excision. Their fourth patient was reported to be in good health although only 3 months postoperative. These authors state that reticulum cell sarcoma is a more uncommon tumor than lymphosarcoma and probably has a worse prognosis. They consider spindle cell sarcoma to be a very rare tumor which appears to be of relatively benign character. Due to a universal lack of experience we believe that it is impossible to make

a definite statement regarding the prognosis of sarcoma of the rectum. However, it seems likely that the prognosis should be much the same as for sarcoma in other parts of the body; that is, the outlook is always grave. This is especially true for lymphosarcoma. Undoubtedly, the prognosis of the spindle cell or fibrosarcoma is better than that of lymphosarcoma and we feel that in some of the low grade tumors of this type the chances for cure with a radical excision are good.

Treatment: As for sarcomas in other parts of the body, the treatment of choice is early radical excision of the growth and some authorities feel that supplemental irradiation therapy is indicated. It is the opinion of the authors that the value of irradiation therapy will be determined by the histologic type of the sarcoma.

Case Report

L. F., a 72 year old colored female, entered the John Gaston Hospital on Sept. 3, 1948. Her complaints upon admission to the hospital were vaginal bleeding and the intermittent protrusion of a mass from the rectum upon defecation. She gave a history of menopause 20 years before, with no further vaginal bleeding until 2 months prior to hospitalization, at which time she noticed some spotting which had continued up until the time of admission to the hospital. Three months before admission she began to experience constipation, with painful defecation and the occasional protrusion of a mass from the rectum upon defecation. There were no other symptoms relative to the gastrointestinal tract. Her appetite remained good and there was no weight loss.

Examination revealed a fairly well developed, well nourished, elderly negress, who did not appear acutely ill. The pertinent findings in the physical examination were limited to those elicited upon rectal and pelvic examinations except for hypertension (190/100) with an associated cardiac enlargement. Rectal examination revealed a polypoid mass measuring 5 by 4 by 3 cm. attached by a broad base to the right anterolateral wall of the rectum just proximal to the mucocutaneous junction. This tumor was soft and had a colloid appearance and could be delivered through the anus with the examining finger. Vaginal examination showed an ulcerating mass measuring 4 by 2 by 1 cm. on the right posterolateral wall of the vagina extending up to and including the entire posterior lip of the cervix. Bimanual examination revealed a palpable thickening and induration extending into the right broad ligament and seemingly connected to the vaginal mass. There was no demonstrable relation between the vaginal or broad ligament mass and the rectal tumor.

Laboratory findings were indicative of a mild anemia with 9.5 grams of hemoglobin and 3,000,000 red blood cells. The white blood count was 8,500 and the differential count was normal. The urinalysis was negative. Smears of sputum and gastric washings were positive for tubercle bacilli. Cystoscopic and x-ray examinations of the urinary tract revealed no involvement of the urinary bladder or upper urinary tract. X-ray of the chest revealed considerable thickening over the right pleural cap in the region of the first interspace with some associated parenchymal involvement. In the opinion of the roentgenologist the findings were compatible with a chronic type of tuberculosis.

On the first day of hospitalization biopsy specimens were taken from the vaginal and cervical lesions and also from the rectal mass. The histologic examination of these tissues revealed a typical picture of an anaplastic squamous cell carcinoma in both vaginal and cervical lesions, probably primary in the

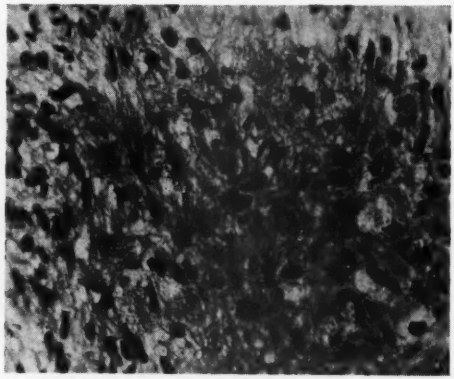

Fig. 1. Photomicrograph (high power) of spindle cell carcinoma of the rectum. Note the characteristics of malignancy including the variation in size and shape and the staining quality of the cells. Also note the bizarre arrangement of the cells and the mitotic figures.

cervix. The microscopic study of the tissue taken from the rectal mass was not diagnostic, only normal rectal mucosa being seen. This finding, together with the gross appearance of the tumor, was considered compatible with a benign rectal polyp. X-ray therapy as a palliative measure for the vaginal and cervical lesion was instituted on September 9. The patient received a total of 1600 r to 2 anterior ports and 1400 r to 2 posterior ports giving a depth dose of 1700 r at the cervix over a period of 3 weeks.

The rectal polyp was excised and the base cauterized on September 10, seven days after admission. The histologic examination of the removed specimen presented the picture of a spindle cell sarcoma. In view of the patient's age, the presence of active pulmonary tuberculosis, and a far advanced squamous cell carcinoma of the cervix and vagina, it was felt that no further treatment for the rectal tumor was indicated even though it was malignant.

When last seen 8 months postoperatively there was no evidence of recurrent rectal disease. The palliative result in the vaginal and cervical lesions was considered good in that the lesions were reduced in size and the patient was more comfortable.

Summary

A review of the literature on sarcoma of the rectum is presented and an additional case reported. The relative infrequency of sarcoma of the rectum and the difficulty encountered in making the diagnosis is emphasized. A brief review of the symptomatology,

physical findings, proctoscopic appearance, and gross and microscopic characteristics of the lesion is given.

A case of sarcoma of the rectum is reported in an elderly patient with coexisting far advanced carcinoma of the cervix and active pulmonary tuberculosis.

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DIVERTICULITIS OF THE COLON

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THE existence of multiple diverticula of the large bowel is called diverticulosis. This condition produces no symptoms and requires no treatment. But when diverticula become the site of an inflammatory process the condition is called diverticulitis. This lesion may lead to a thickening of the wall of the involved segment and a narrowing of its lumen. Further complications of this condition may also result; namely, perforation, sinus, fistula and obstruction. It shall be my object to advocate a plan of treatment of this debilitating disease whereby these serious complications can be prevented.

Diverticula are herniations of the mucosa through the wall of the bowel at the sites of least resistance: probably the points at which blood vessels pierce the wall of the bowel. Dixon states that such herniation is produced by contractions occurring simultaneously both distal and proximal to a normal bowel segment. The increased tension which is created in a normal segment by the above mechanism causes herniation of small portions of the mucosa through the wall of the bowel.

Diverticula become filled with fecal material obstructing the small openings and the presence of pathogenic organisms produces an infection. Small abscesses are formed in the mucosa of the wall of the diverticula and this process spreads to the wall of the bowel, causing a thickening of the wall and narrowing of the lumen of the bowel.

The diagram below from Edwards gives some idea of the development of this condition and its complications.

It is estimated that 5 per cent of persons subjected to a roentgenographic study of the large bowel by barium enema show diverticulosis, and that 12 per cent to 15 per cent of this 5 per cent develop diverticulitis. The disease occurs more frequently in the male. The large majority of diverticula occur in the left side of the colon especially in the sigmoid, where the incidence of diverticulitis is higher in proportion, due to the firmness of the fecal content in this region.

The symptoms vary naturally with the stage of the disease. An acute diverticulitis starts with anorexia, malaise, generalized aches and pain over the affected area, usually the left lower quadrant. Localized tenderness develops, the temperature is elevated as is the

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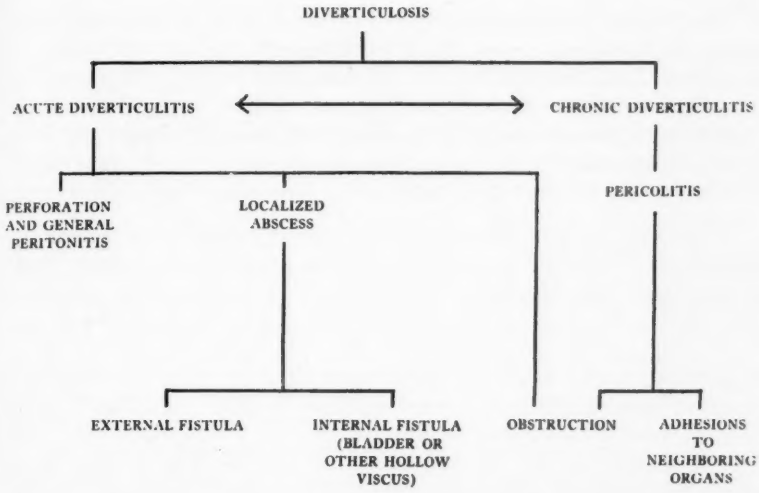

leukocyte count; crampy pain and distention follow. These symptoms usually subside with bed rest, a bland diet and mineral oil.

The patient may remain symptom free or may have mild discomfort from time to time; or he may have repeated acute attacks which lead to a peridiverticulitis and obstruction. The diverticulum may perforate and cause a diffuse peritonitis with a high mortality. On the other hand it may perforate with the formation of a localized abscess. This abscess may resolve, may drain into the bowel, or may rupture into an adjoining organ such as the bladder, or may dissect to the outside producing an external fistula. With increased narrowing of the lumen of the bowel by the inflammatory process and its adherence to adjacent structures, a mass may be felt, and obstruction of varying degrees will here take place.

Bleeding occurs; on occasions it may be profuse. Some writers report bleeding to occur as rarely as in 5 per cent of their cases; others report it as high as 15 per cent. At one time bleeding was thought to be a definite sign of malignancy but this is erroneous.

A careful history and physical examination will lead to the clinical diagnosis of diverticulitis, and roentgenology by a competent man will substantiate it. The diverticula can be seen in the barium contrast studies associated with spasm, hypermotility and varying degrees of obstruction. At times, even with the valuable help of the roentgenologist, it is difficult to determine the difference between carcinoma and diverticulitis. Proctoscopy is also helpful in making the diagnosis of diverticulitis or in differentiating it from a malignancy.

The sudden perforation of a diverticulum into the peritoneal cavity with resulting generalized peritonitis is difficult to diagnose. It is often confused with a perforated ulcer or perforated appendix. The history of preexisting diverticula is most helpful. This acute condition requires immediate operation with closure of perforation; a colostomy above as recommended by Rankin is no doubt a wise procedure. R. R. Graham feels that this procedure is not necessary.

In the literature on this subject all writers agree that the complications of diverticulitis, namely, abscess, fistula, obstruction and perforation, require surgical intervention. But many surgeons state that until such complications arise surgery has no place in the treatment of this debilitating condition. We are impressed, nevertheless, with the fact that when the majority of patients with the complications of diverticulitis are referred for surgical treatment, they already have suffered long periods of disability, with much pain and loss of time from their occupation. It is obvious that if these complications could be prevented, the patients would be greatly benefited. To that end, in recent years, we have advocated and practiced an early resection of the involved segment of bowel in a limited number of diverticulitis cases. We have selected only those patients who have continued to have symptoms and who, over a period of time, when examined by barium enemas have constantly shown changes in the involved segment of bowel. Our results have been gratifying and our patients grateful. But please do not misunderstand me—we do not recommend resection of the colon for every patient with an acute attack of diverticulitis. We fully realize that the majority of these get well with symptomatic treatment.

If the disease has progressed to the point where a tender mass can be felt or an abscess develops it is sound judgment not to open it unless absolutely necessary. If a colostomy is done above the diseased segment of bowel the mass or abscess will usually recede. Most fistulæ are caused by drainage. Mayfield and Waugh in their recent report noted that 14 out of 17 fistulas resulted from drainage.

In cases complicated by obstruction and fistula we advocate a colostomy above the lesion in the transverse colon when possible, and a period of careful observation with the purpose of resection later, if necessary. As a general rule we feel that if there is enough evidence to do a colostomy there is enough evidence to do a resection of the diseased segment at a later date, excepting of course, in the case of acute obstruction with sudden onset.

At the Johnston-Willis Hospital in the 10 year period from 1938 to 1948 there were 35,051 general medical and surgical admissions. Sixty-nine of these patients had symptoms of diverticulitis or its

complications, and in all these a definite diagnosis of diverticulitis was proved. In 9 of these diverticulitis cases some surgical procedure was carried out. One patient had a carcinoma which developed at the site of the chronic diverticulitis. In 3 cases an acute obstruction occurred with an acute attack of diverticulitis, and for them a colostomy was performed above the obstruction. In each of these 3 cases the diverticulitis and the obstruction cleared up sufficiently for closure of the colostomy and thus far there has been no recurrence. One case had developed a complete obstruction over a long period of time. A transverse colostomy was performed, followed by a resection of the diseased sigmoid. The colostomy was closed and the patient has remained well for several years.

In 4 of these 9 surgical cases a primary aseptic resection for diverticulitis was performed. In each case symptoms of chronic diverticulitis had been present for a long time and barium enemas repeated at intervals had shown diverticulitis with pericolitis. Our technical procedure is similar to that advocated by Stone for primary aseptic intestinal anastomosis, using the Stone clamps. We are convinced that by resecting the diseased portion of the bowel at this stage of the disease the complications which carry a higher mortality and high morbidity can be prevented.

All diverticulitis patients are prepared for operation with great care, and in the usual manner required for other colon cases. When possible the intestinal tract is intubated with a Miller-Abbott or Cantor tube prior to operation. If this is not done a cecostomy to be opened later is performed through a McBurney incision at the time of operation. All possible effort should be exerted to prevent tension at the line of suture in the resection of any inflammatory lesion of the colon. In our experience primary resection of inflammatory lesions of the colon is more difficult than resection of malignant lesions.

Postoperative care is carried out as in any colon resection.

There have been no deaths following any of the surgical procedures in these cases.

Conclusion

Diverticulitis is a debilitating disease with a high morbidity. The mortality is high in its complications, as is the morbidity. When acute obstruction develops with sudden onset a colostomy above the lesion is the procedure of choice. This may later be closed. Abscesses should be opened as the last resort. If the fecal contents are diverted by a colostomy the abscess usually will recede.

Many complications of diverticulitis can be prevented by early

resection of the diseased segment of the bowel. When the symptoms and roentgenologic findings of diverticulitis and peridiverticulitis persist over a period of time, we are convinced that resection of the diseased bowel is indicated.

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DOES THE PATHOLOGIST NEED THE CLINICIAN'S COOPERATION?

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HELPING to build a happy and healthy society is the chief goal of the physician. From ancient times he has tried to learn and to profit from experience in order to help suffering mankind. By now he has accumulated such an impressive detailed knowledge that it has become increasingly difficult and even impossible for the individual to master it in every field. This state of affairs carries in itself grave and obvious inherent dangers. But at the same time it constitutes a challenge to the medical profession as a group and team. It has brought forth the need of developing closer and closer links between physicians working in different fields and specialties.

In order to achieve optimal results in this teamwork it is not only necessary to show good will and general understanding, but also constant exchange of information and of experiences, objective criticism and grateful acknowledgment of help received. This will serve to provide solid foundations for satisfactory progress to the benefit of our patients.

Let me give you an example of the considerable achievements obtained in modern medicine by close collaboration and teamwork in which clinician and pathologist played the main rôles.

Years ago, in 1928, Doctor Papanicolaou, a cytologist especially interested in the morphologic expression of endocrine activities, drew the attention of clinicians to the fact that the examination of stained vaginal smears may be revived as a suitable method to recognize malignant tumors in the female genital tract. His suggestion at that time met, if not with scorn or hostility, at least with anything but favorable response. Pathologists and clinicians alike clung dogmatically to their preconceived and traditional concepts, saying that isolated tumor cells do not show markings clear enough to be used for a reliable diagnostic test. Papanicolaou realized that his knowledge and experiences as a cytologist might after all not be adequate to allow him to insist on his opinion without further studies, which he took up in cooperation with experienced pathologists and interested, openminded clinicians who painstakingly checked on every step and aspect of the whole problem. When, years later, in 1943, he and his co-workers reentered the arena they

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were well armed and equipped to fight the battle through. After a few years and step by step, the old prejudices went overboard; the gynecologists, general surgeons, chest surgeons, urologists, enterologists and pathologists became interested and gave the method a fair trial. All of them, or nearly all of them, finally capitulated to overwhelming evidence. Today "exfoliative cytology" has to be regarded as one of the standard diagnostic methods of clinical medicine. Its establishment was made possible only by the intimate collaboration of all men in the field. It is now the pathologist, however, who carries the brunt of the burden and he was taught by the research man and the clinician how to use his experience to the best advantage.

It is not only in the advancement of knowledge, and not only in research, but in everyday work that close cooperation proves most necessary and most gratifying to all concerned. The following discussion will be confined to the teamwork between clinician and pathologist in surgical pathology.

"The Patient Is the Thing." He is in the center of all our endeavor. When he consults the physician he expects to be cured and relieved from suffering on the basis of a correct diagnosis. In order to achieve this the physician needs the active cooperation of the patient. The physician, in turn, may need help and advice, and thus become for a time a patient ex officio. It is only logic that being in this situation not only does he expect assistance freely rendered by the consultant but that he provides all possible cooperation and intelligent help. This process so routinely used among consulting physicians is very often neglected in the relationship between the clinician and the pathologist.

The main reason for this lack of satisfactory cooperation seems to me to be due primarily to an ill-conceived idea of the pathologist's position in the structural set-up of modern medicine. He is the liaison officer between applied medicine and science. In his handling of instruments rather than patients, it may appear that he is a representative of absolute and theoretic science, a situation thought to be analogous to the case of a physicist who is given an experimental problem which he with his instruments and calculations will attempt to solve. But this concept and approach are fallacious. The fact is overlooked that the pathologist still deals with bodily substance and structures, with biologic matter; biologic matter, however, is given to reactions and behavior patterns that very often do not obey direct cause and effect mechanisms and, therefore, appear to behave ambiguously. Morphologically similar or even identical lesions may be the result of a mechanical or chemical injury, of an inflammatory noxa, or may be the expression of autonomous growth. How-

ever, the final clue to the solution of the problem in a given case will often depend on clinical information.

No instance will illustrate this concept better than the lesion we find in myositis ossificans, the microscopic picture of which very often so closely imitates the picture of a sarcoma that we may be safe in assuming that innumerable limbs have been sacrificed in vain. Although we have by now fairly clear criteria even in the morphologic field to tell a myositis from a fibrosarcoma when truly representative specimens are removed, it still will be of the greatest importance for the clinician and the pathologist alike to discuss the case freely. The history of trauma, the close sequence in the appearance of the tumor and the peculiar x-ray picture, may then clarify the situation to the benefit of the patient.

A few cases and microscopic pictures will be discussed where lack of contact between the clinician and the pathologist would easily have led to grave diagnostic mistakes.

A glandular cystic endometrium would by no means be remarkable if it were encountered in a young woman. In a given case, it was, however, particularly stressed that the material submitted was removed from a woman 65 years of age, 10 years after her menopause; she had not had any folliculin treatment. With this information at hand the entire aspect of the case changed and an ovarian tumor was suspected. A surgical intervention was performed and a granulosa cell tumor of the left ovary found.

In sections of the placenta of a young fetus usually during the first 4 weeks of the pregnancy it is common to find a completely erythroblastic red blood picture in the fetal vascular system. If the case history clearly indicates that the material submitted for microscopic examination originates from a spontaneous abortion of between the fifth and sixth month, marked attention has to be paid to large numbers of erythroblasts in the fetal vessels. The diagnosis, then, is that of a fetal erythroblastosis, which interpretation may be supported by scattered foci of proliferation of the trophoblast very much like that seen in a hydatiform mole; the diagnosis can be confirmed by a determination of the Rh-factor in the parents and the antibody test in the mother's serum.

The lymph node seen in Figure 1 was described as a biopsy from a case of generalized lymphadenopathy. The small, round cell tumor with infiltration of the capsule and pericapsular tissues seemed to justify the diagnosis of a malignant lymphoma. But when the diagnosis was discussed in a staff meeting the clinician mentioned that the patient from whom the biopsy was taken had been found to have a lung lesion very suspicious of a carcinoma. Clinically, it

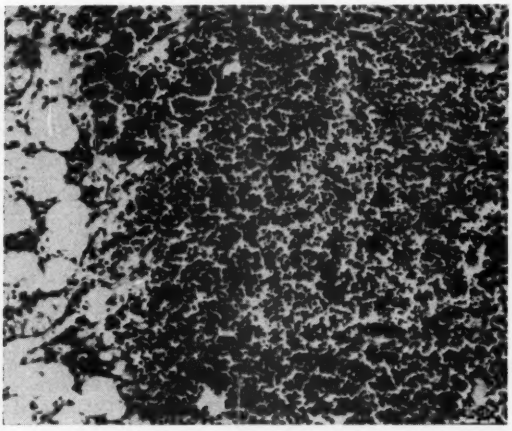

Fig. 1. Cervical lymph node (biopsy material) showing unorganized infiltration of a small-cellular tumor into the capsule and pericapsular fat tissue.

was thought that the lymphadenopathy was due to a metastatic spread of this lung tumor. We could not but agree with this possibility which was confirmed by an autopsy performed a few months later when an oat-cell carcinoma (fig. 2) of the right upper lobe bronchus was found, of which you see a picture here.

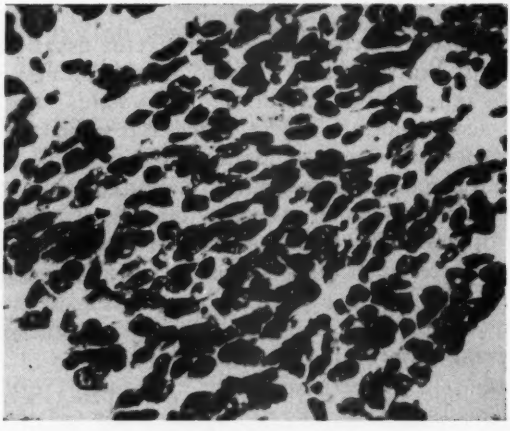

Fig. 2. Same case; lung tumor (autopsy material); "oat-cell" carcinoma.

Lymph nodes in general may cause very marked difficulties in diagnosis and it is, therefore, of the greatest importance that the clinician realize that there are certain nonspecific changes in the

lymph nodes which, although negligible and practically insignificant in one case, may constitute the initial lesion of a grave and generalized malignant lymphadenopathy in another.

Catarrhal subaxillary lymphadenitis found in a young woman may be the result of a manicure infection. It can, however, microscopically hardly be distinguished from other cases where a similar lesion is an initial stage of a generalized Hodgkin's disease. Anyway, sufficient clinical information will help to avoid a wrong interpretation.

This series could be continued by a long list of similar cases and every physician has most certainly had similar experiences. Let me remind you only of the difficulty in diagnosing the skin of an Addison's disease unless it is specifically mentioned that the skin biopsy is taken from a white individual.

No less important than the information about the patient from whom the specimen is removed is the specimen itself. In order to allow a satisfactory diagnosis this specimen has to be representative and in good condition. Meeting both these requirements depends to a vast extent on the understanding and foresight of the clinician.

Technical difficulties in obtaining suitable shipping containers and other transport problems may easily lead the surgeon to refrain from sending large specimens removed, in their entirety, as for example, an entire breast, a large tumor, a uterus with adnexa, etc. In such cases only parts of the specimen may be submitted for examination. The diagnosis then made will be regarded as representative for a whole. The dangers of such a procedure are obvious. To give only two examples, a fibrocystic breast may also contain a small carcinoma; or a chondromatous tumor of the iliac crest may show its true malignant nature only in a few areas. The clinically important lesions may or may not be included in the submitted portion. Anyway, in those and similar cases involuntarily the clinician forces the pathologist to assume the whole responsibility on partial evidence, where he should be allowed to carry the whole responsibility for the whole specimen, whenever possible.

The importance of the proper site and size of biopsies is, practically speaking, generally realized. Two instances encountered within the last year may illustrate to you how important it is to evaluate properly a lesion and the specimen taken therefrom.

There is a young woman who had been seen for several months in prenatal clinic. By the end of her pregnancy, which passed entirely uneventfully, she frequently complained of pain in her left breast, which was interpreted as a physiologic pain due to the development of the lactating breast. She delivered spontaneously and

her postpartum course was not remarkable up to the third or fourth day when she suddenly developed fever with tenderness under her left arm and over the thorax. It was then for the first time that a spindle-shaped swelling was noticed over the third rib in the axillary line. A biopsy was being obtained under the impression of an osteomyelitis of the rib. On incision a soggy tissue covered the rib and the intercostal space. It was of yellowish color and the diagnosis seemed to be confirmed. On exploration of the field the surgeon

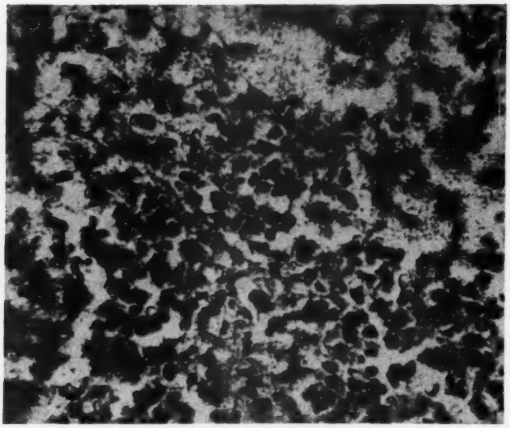

Fig. 3. Acute cellulitis surrounding malignant tumor of a rib.

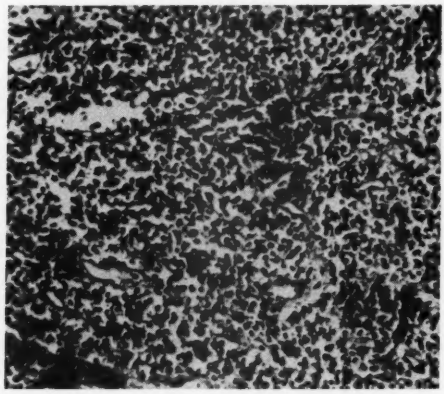

Fig. 4. Same case; tumor of the rib: Ewing sarcoma.

noticed, however, in the neighborhood a small, firm nodularity of the adjoining periosteum which he thought could not be explained

by an osteomyelitis; a separate biopsy from this area was obtained. The two specimens were processed separately and seeing the following two pictures you will agree that a mistake could easily have been made. Figure 3 shows a marked leukocytic and fibrinous exudation into loose connective tissue whereas Figure 4 presents the unmistakable picture of a malignant tumor which was diagnosed as an Ewing sarcoma. This diagnosis was later on confirmed by autopsy.

In the second instance a small biopsy from a cervix was submitted. The picture was that of edematous myxomatous tissue not covered by epithelium and containing no glands. We felt rather sure that this had to be interpreted as an edematous marginal area of an erosion with myxomatous changes in the stroma. These findings were discussed with the surgeon who was rather surprised as he felt absolutely sure from the gross findings that the lesion must have been a malignant tumor. He described it as a large cauliflower-like gelatinous and ulcerated mass involving the whole vaginal portion of the cervix and the posterior wall. He performed a second and this time very large biopsy, the reading of which did not meet with any difficulty and had to be interpreted as a myxosarcoma.

All these considerations are, of course, familiar ones, but I do not want to close this discussion without having drawn your special attention to the artefacts caused by improper handling of specimens.

The care of the specimen begins well before the actual removal starts. Years ago I received a cervical biopsy together with endometrial curettings. The microscopic examination of the cervix revealed an entirely denuded surface without remnants of epithelium or any other specific markings. By pure coincidence, within the massive corpus endometrium a small piece of atypical squamous epithelium was found which had to be interpreted as a preinvasive carcinoma. Upon discussion of the findings, the surgeon readily admitted that he had cleansed and swabbed the vagina and portio prior to the curettement which was followed by the biopsy of the cervix. In doing so he had removed incidentally the surface layer containing the malignant lesion. Another biopsy of this same cervix confirmed the finding of a carcinoma in situ. We feel that no better example could be found to demonstrate the danger of rough mechanical handling of delicate biopsy sites.

May I make a crude statement to clarify my point? When taking biopsies, then, for a short time at least, the patient should be less cared for than the specimen. A little bleeding or pain and discomfort will not hurt the patient as much as a wrong diagnosis.

The greatest enemy of the pathologist is the hot cautery. And,

although its use has certainly important advantages, it sears, scorches and burns the tissue sometimes to such an extent that the reading of such sections becomes a true ordeal. Burnt surfaces, pseudovacuoles from steam bubbles and complete distortion of the structures due to micro-explosions characterize the battlefield. If a cautery is to be used, the biopsy specimen should first be taken with a sharp instrument and the site of removal thereafter cauterized. Cauterization should, however, be delayed, if instead of a classic biopsy only Papanicolaou smears are obtained; the report on the examination should be awaited before other measures are taken. Otherwise, the field might be mutilated for biopsy studies, when smears suggest the possibility of an existent malignancy.

Once obtained, the specimen should be carefully protected against drying and mechanical injury, especially squeezing. Both these injuries are likely to be inflicted on a small specimen when put on or wrapped in gauze, a procedure which may injure the structures, especially of soft tissues, as badly as a cautery does.

Dried squamous cell lining of the portio and dried corpus endometrium may present a most peculiar aspect and assume features dangerously similar to that of highly cellular and even pleomorphous neoplastic tissue. A small biopsy specimen of a typical lymphosarcoma which we examined some time ago had become almost irrecognizable by squeezing with a forceps. Misinterpretations or unsatisfactory results may also occur when specimens are allowed to stand for any length of time without being transferred into a fixing solution; the most widely used and universally applicable still is the one-in-ten watery solution of commercial formaldehyde.

I have tried to show how much the pathologist depends in his work on the clinician's cooperation in the hope that this may help to obtain increasingly gratifying results in our work to the benefit of our patients.

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TREATMENT OF VARICOSE VEINS BY EXCISION PREFERABLE TO LIGATION AND INJECTION

Varicose veins may be described as a degenerative progressive disease affecting particularly the walls and valves of the poorly supported superficial veins of the lower extremity, the extent of involvement being more or less general. Heredity is the most important etiologic factor; however, the disease process is aggravated by an increase in hydrostatic pressure as caused by pregnancy and certain diseases and occupations. The symptoms and complications are primarily due to the resultant venostasis. It is to prevent and correct venostasis that treatment is directed. Esthetic considerations are important, but not of primary concern.

Based upon this conception the principles upon which treatment is based consist of reducing the size of the superficial venous bed by obliterating the larger and medium-sized diseased veins, and protecting the superficial veins from increased hydrostatic pressure by severing connections between the deep and superficial venous systems. This may be accomplished by several methods used either singly or in combination.

Ligation of the greater saphenous vein and its tributaries in the

Department of Surgery, Medical College of the State of South Carolina, and Roper Hospital, Charleston, S. C.

femoral region, with ligations at lower levels, accompanied by the intravenous injection of sclerosing solutions, at the time of operation and subsequently, constitutes the most commonly used form of treatment. The ligation phase of this treatment is sound, but the intravenous injection of sclerosing solutions is open to serious criticism. It may be followed by severe systemic reaction. An injection of even a small amount of fluid may cause an alarmingly extensive thrombosis with marked swelling of the leg and thigh. On the other hand, little or no thrombosis may result from the injection of a relatively large amount of solution. The injected solution commonly finds its way into the deep veins, as indicated by the distribution of the radiopaque dye used in making venograms, and may cause deep venous thrombosis with resultant permanent damage. To obtain a sufficiently complete thrombosis is often difficult if not impossible, as subsequent percutaneous injections, especially in obese subjects, enter primarily the subcutaneous veins, and not the all-important subfascial saphenous trunks, in distribution and concentration sufficient to cause a uniform thrombosis. The thrombosed veins may not remain obliterated as the thrombus may be resolved or recanalization may take place. From the standpoint of effectiveness, the most serious criticism is the failure to obliterate satisfactorily the communications between the deep and superficial systems, an important factor in the development of recurrences. In brief, the treatment of varicose veins by ligation and injection is productive of early good results, but is accompanied by considerable risk of local and systemic reactions, and damage to the deep veins of the leg. It is followed by a high incidence of recurrence. The injection of sclerosing solutions should be abandoned except possibly for the obliteration of small, but unsightly, varicosities.

The treatment of choice is excision, under visual and palpable control, of the subfascial trunks of the greater and lesser saphenous systems, their larger tributaries including varicose plexuses, and varicosities arising from perforating veins of other than saphenous origin. The effective use of the stripper is practically limited to the removal of the subfascial trunk, the tributaries being only severed as they branch off. Its value is particularly limited when the veins are friable, and in some types of anatomic variations.

Treatment by extensive excision is practically devoid of serious complications and is productive of better results. Due to the nature of the disease, recurrence is always possible, but when it occurs it is usually of limited degree and amenable to treatment by the same method.

WILLIAM H. PRIOLEAU, M.D.

BOOK REVIEWS

The Editors of THE SOUTHERN SURGEON *will at all times welcome new books in the field of surgery and will acknowledge their receipt in these pages. The Editors do not, however, agree to review all books that have been submitted without solicitation.*

TEXTBOOK OF SURGERY BY AMERICAN AUTHORS. Edited by FREDERICK CHRISTOPHER. Fifth Edition. Pp. 1550, with 1465 Illustrations. Philadelphia: W. B. Saunders Company, 1949.

Dr. Christopher has, with his contributors, revised much of the old text in this fifth edition. The subject matter is based on tested and accepted present day principles of surgery. Etiology, pathology and diagnosis have been properly stressed and the correct surgical treatment has been carefully described. Each subject is treated in a concise manner, which is of necessity when one considers the vast amount of material which is covered in this single text. The arrangement of the contents has been somewhat altered, the sections on shock, acidosis and alkalosis, and water and electrolyte balance have been moved forward in the book. Entirely new sections of the book have been written in a large number of instances.

This fifth edition should find its place in all the medical schools throughout the country as well as on the bookshelves of all the surgeons; it is a job well done.

A. H. L.

ATLAS OF SURGICAL OPERATIONS. By ELLIOT C. CUTLER AND ROBERT M. ZOLLINGER. Second Edition. Price, $9.00. Pp. 225, with 106 plates. New York: The Macmillan Company, 1949.

The authors have completely revised this popular atlas to offer more extensive and clearer presentations of surgical operations. Greater detail and modern procedures have been added, enhancing the book's value to students and to those occasional surgeons whose experience and activities may be limited to a community away from medical centers. In all, sixty-nine new plates have been added, and twenty-six new procedures are explained.

As was the practice in the old edition, there is a description on the facing page of the procedures illustrated, which makes reference quick and easy. The drawings were done by Miss Mildred Codding and are of the pen-etched type; there being no smudging at all, they're quite clear and easily understandable. The only major objection to the volume is its size, which makes it practically impossible to fit in the usual bookshelf; however, this size does lend itself very nicely to the drawings.

This book should be invaluable to the surgical intern or resident since he will be able to familiarize himself in a few minutes with the operations of the following day.

A. H. L.

OPERATIVE TECHNIQUE AND SPECIALTY SURGERY. Edited by WARREN H. COLE, with an Introduction by ALLAN O. WIPPLE. Pp. 725. New York City: Appleton, Century, Cross, Inc., 1949.

The editor has in this second volume brought together men in the different fields, men so well known that reading a list of their names sounds like the "Who's Who" of American surgeons. Each man is chosen for his known accom-

plishments and recent contributions to the technic of the various fields, each author gives in detail a clear description of the procedure he has found to be most effective for each lesion. Dr. Cole has chosen recognized leaders, noted for their skill as operating surgeons—surgeons who have had previous training in general surgery.

The text is quite modern. The illustrations certainly serve the purpose as well as can be expected and yet, because they come from various authors, the style is not exactly the same and, therefore, they are not as pleasing to the eye as other types of illustrations might be.

This volume should find its place alongside the volume on General Surgery in every surgeon's library.

A. H. L.

ABSTRACTS FROM CURRENT LITERATURE

CANCER OF THE BREAST. H. Glenn Bell, *Ann. Surg. 130*:310-317 (Sept.) 1949.

After analysis of 819 cases seen at the University of California Medical Center from July, 1930, to January, 1944, the author has concluded that the employment of roentgen ray therapy as an adjunct to the surgical treatment of carcinoma of the breast has not significantly increased the five year survival rate. In the Stage I (axilla negative) cases, a higher percentage of patients treated by surgery alone were living and well after five years than with surgery combined with either preoperative or postoperative x-ray therapy. In the Stage II cases, the percentages were approximately the same with radical surgery alone and with radical surgery preceded by x-ray therapy. In the Stage III cases, both radical surgery with preoperative x-ray therapy and simple mastectomy with postoperative x-ray therapy produced better results than did radical surgery alone. In 557 cases encompassing all three stages radical surgery alone produced the best results with 53.6 per cent living and well after five years, with radical surgery plus preoperative x-ray therapy giving 41.2 per cent and radical surgery plus postoperative x-ray therapy giving 36.0 per cent five year "cures."

In this series there was no significant difference in the percentage of patients exhibiting arm swelling in the group treated with surgery alone and in those in whom surgery was combined with x-ray therapy. In both instances it was remarkably low at 3.4 per cent and 5.8 per cent respectively. In none of these cases was the swelling incapacitating.

This study will be continued.

DIAGNOSIS OF PREINVASIVE CARCINOMA OF THE CERVIX. Joseph Skapier, *Surg., Gynec. & Obst. 89*:405-410 (Oct.) 1949.

During the last decade the diagnosis of this type of carcinoma of the cervix has been made with increasing frequency. This type of early tumor is most often detected in cancer prevention clinics during routine pelvic examination of presumably healthy, asymptomatic young women. During the two year period prior to this report, the technic of Papanicolaou has been followed in collecting and studying vaginal smears at the Strang Clinic of Memorial Hospital in New York and of the 10,000 new female patients seen during this period, 30 cases of cancer of the cervix have been detected. In 28 of these 30 cases, the diagnosis was first made by smear and later confirmed by biopsy. Of the 30 cases, 21 (70 per cent) were of the early preinvasive type. The ages of these patients ranged from 35 to 56 years.

A concise discussion of the criteria for making the diagnosis of preinvasive carcinoma is included and will be of particular interest to the cytologist. Though the findings in the smears usually corroborate those in the tissue sections, certain characteristics of the malignant cells can often be demonstrated better in the smear than in the section. The exfoliated malignant cells in preinvasive tumors can often be detected prior to the appearance of a visible focus. This simple method of screening in cancer prevention clinics is considered to be a very reliable and efficient test for the detection of preinvasive carcinoma of the cervix. The author feels that ten minutes' study of the vaginal and cervical smears is quite sufficient and he denies the "high cost" of this procedure claimed in recent articles and editorials. He considers the detection of three to four early preinvasive carcinomas of the cervix per 1,000 presumably healthy women examined to be an encouraging result.

THE ANATOMY OF THE HERNIAL REGIONS. Harry J. Anson; Edward H. Morgan, and Chester B. McVay, *Surg., Gynec. & Obst. 89*:417-423 (Oct.) 1949.

Over a period of several years, more than 500 body halves have been studied for the anatomy of the inguinal region and smaller numbers for the structure of the femoral and obturator areas. During the process of investigation, certain specimens were encountered which served ideally for the instruction of classes in applied anatomy concerning the hernial relationships. This paper is an effort to employ this method in a publication. The statements made in this paper are based chiefly on the few specimens from which the very lucid illustrations were taken but they are supported by data not specifically cited which is in general agreement with the descriptions presented. The conclusions are quoted:

"The external oblique stratum, in the inguinal region, is composed of aponeurotic fibers invested on each surface by a fascial layer. The internal oblique layer is formed mainly of muscle fibers similarly invested by fasciae. The transverse abdominal layer is formed in like manner; however, in its infero-medial portion muscle fascicles are usually wanting, being sometimes replaced by fragmentary aponeurotic fibers. In those instances in which both fascicles and fibers are absent, the investing fasciae, fused, complete the layer inferiorly.

"In its course through the inguinal wall the spermatic cord carries downward an investment from each of the three layers. The lower, fascial, part of the transversus layer becomes tubular about the spermatic cord in the plane of the abdominal wall, the tube resembling a curved pipe emerging from a flat surface. The internal oblique stratum does not invest the cord tightly at its proximal end, but surrounds the cord as a broad infundibuliform investment. There is no reduplication to form an 'intermediate inguinal ring'; therefore, the mouth of the funnel is usually over twice the size of the abdominal inguinal ring. After acquiring its cremasteric coat, the cord passes forward between the aponeurotic crura of the external oblique layer, carrying with it the external spermatic fascia, in tubular form, from the triangular area between the two aponeurotic crura.

"In advanced cases of indirect inguinal herniation, the external and internal rings are superimposed upon each other; the sac, having moved downward and medialward in fascial tissue, ultimately reaches a point where further excursion is hindered by the rectus muscle.

"Each of the strata which invest the spermatic cord reflects in general the character of the source on the inguinal wall. The contribution from the external oblique is entirely fascial; it consists of the conjoined fasciae which invest the external oblique aponeurosis. Fused into a single layer at the subcutaneous inguinal ring, it forms the external spermatic fascia.

"The layer derived from the internal oblique (the cremasteric layer) is carried downward, not from the definite margins of an aponeurotic fault or cleft, but rather from a layer which regularly contains muscle fascicles in its inguinal portion. Since the fascicles displaced to cover the spermatic cord are few and attenuate, the cremasteric coat is predominantly fascial.

"The portion of the transversus layer (the internal spermatic fascia) which contributes developmentally to the set of funicular coats, and, therefore, to the hernial coverings, is that part which is situated between the arching trans-

versus musculature superiorly and the transversalis fascia inferiorly. The layer represents a fusion of the thin outer lamina of the investing fascia and the thicker inner one, the latter being the transversalis fascia.

"The preperitoneal connective tissue is usually a definite layer on the inguinal wall, but it is variable in character on the hernial sac. On the inguinal parietes and within the pelvis, it houses the iliac vessels with their branches and tributaries, together with the lymphatic glands and vessels. Of these retroperitoneal and retrofascial structures, the inferior epigastric vessels bear an important relation to the enlarged abdominal inguinal ring in indirect hernia; they are displaced, to lie beneath the hernial mass.

"The peritoneal sac originally passes through the wall in an oblique or indirect course. Finally, when its course becomes direct, the sac gains contact medially and caudally with the displaced inferior epigastric vessels. These vessels are pressed into a position behind the rectus muscle; the muscle then constitutes the medial boundary on the hernial orifice, the triangular space of Hesselbach being obliterated. As a consequence, the inferior epigastric vessels, in being thus displaced, pass from the medial to the inferior aspect of the sac. In company with these vessels, which cross the floor of the abdominal ostium, are also situated the iliac artery and vein, the ductus deferens, the internal spermatic vessels, and certain of the external iliac lymph glands."

The authors agree that the presence of a patent serous diverticulum is the chief predisposing factor in the development of an indirect inguinal hernia.

STUDIES IN ACUTE CHOLECYSTITIS. J. Engelbert Dunphy, and Frederick P. Ross, *Surgery 26*:539-547 (Sept.) 1949.

This report records the experience at the Peter Bent Brigham Hospital from 1941 through 1947. Following a policy of individual consideration of each case in regard to the advisability of surgery, 148 surgical procedures on 134 patients have been carried out with a mortality of 1.5 per cent. During this period there were 19 cases of acute cholecystitis in which surgery was not performed. Fifteen patients either refused surgery or insisted upon postponing it, two died and in two cases surgery was not recommended. Thus in the entire series, there were four deaths, an overall mortality of 2.6 per cent. There were no operative deaths in patients under 78 years and no deaths in the series under 65 years. All the patients who died entered the hospital over four days after the onset of symptoms.

Ideally all cases of acute cholecystitis would be treated by early cholecystectomy. The poor condition of many patients when first seen and the difficulty in establishing the diagnosis make attainment of this ideal impossible. In 26 instances in this series, the operation was delayed beyond 48 hours because the diagnosis was obscure. Only four of these patients had entered the hospital within 48 hours of onset of the disease.

Cholecystostomy was employed in 22 cases. In five cases this was done because of technical difficulty encountered at the time of operation. In the other cases it was a planned procedure through a small muscle splitting incision under local anesthesia. The authors deplore the tendency to regard cholecystostomy as a compromise procedure and feel that this operation has a definite and permanent place in the surgeon's armamentarium.

The authors conclude that the ideal management of acute cholecystitis consists of early cholecystectomy and exploration of the common duct as is indi-

cated. In approximately 50 per cent of the cases this is not feasible for various reasons. In these cases, the surgeon is faced with the choice between a two stage procedure (immediate cholecystostomy followed by definite cholecystectomy at a later date) and delay in the hope of preparing the patient for a definitive single stage operation. The occurrence of common duct stones in acute cholecystitis is sufficiently frequent to warrant exploration of the common duct in about 35 per cent of the cases. The advisability of varying the treatment to suit the individual cases is reaffirmed.

PREDISPOSING ACTION OF ANESTHETIC AGENTS ON THE VASCULAR RESPONSES IN HEMORRHAGIC SHOCK. B. W. Zweifach, and S. G. Hershey, *Surg., Gynec. & Obst. 89*:469-477 (Oct.) 1949.

It has been clearly shown in experimental shock that a variety of initiating and sustaining mechanisms exist which lead to peripheral vascular collapse. These mechanisms are not consistent in their order of appearance nor do they participate in the same proportion in all subjects. One of the major factors determining the character of the shock syndrome has been shown to be the nature of the anesthetic agent employed. Certain anesthetics (cyclopropane and morphine among others) tend to accentuate the compensatory vasoconstrictor aspects of the syndrome, while others such as ether aggravate the reduction in the circulating volume of blood by depressing the compensatory responses. Still another group (pentothal, for example) depresses the vasoconstrictor responded to a lesser degree than ether. In this study, cyclopropane has been employed as an agent predisposing to a predominantly compensatory response to hemorrhage, ether to provide extreme decompensatory response and pentothal to provide an intermediate response.

Visual observation of the peripheral circulation in the omentum of a dog by a technic which the authors have previously described was employed in this study. The bleeding procedure consisted of an initial blood loss of 2 per cent of the body weight and subsequent small bleedings at intervals. The inhalation anesthesias were given with an excess of oxygen endotracheally maintaining the first plane of anesthesia throughout. Sodium pentothal was given as a single dose of 25 mg. per kilogram of body weight. No other medication was administered.

The most pronounced compensatory ischemia in the peripheral vascular bed was observed in unanesthetized dogs subjected to hemorrhage. The predisposing action of the various anesthetic agents was apparent in vascular changes observed microscopically in the omentum of the dog. It was noted that the three types of vascular response to hemorrhage are correlated with the prognosis for the effectiveness of therapy in each group. Animals showing no functional derangement of the peripheral blood vessels (after cyclopropane) readily recovered after fluid replacement therapy. The intermediate type (after pentothal anesthesia) showed a progressive refractiveness to blood replacement therapy, while the third type (after ether anesthesia) demonstrated an extremely poor response to similar therapy. The data indicate that the compensatory reactions of the peripheral vascular bed can be altered in a predictable manner according to the anesthetic agent employed irrespective of the initiating factor.

EXTENSION OF CARCINOMA OF THE STOMACH INTO THE DUODENUM AND ESOPHAGUS. M. M. Zinninger, and William T. Collins, *Ann. Surg. 130:* 557-566 (Sept.) 1949.

The authors feel that there is considerable reason to believe that many sur-

geons today are performing inadequate removal of carcinoma of the stomach because of deficient knowledge of the nature of its spread. It seems unlikely that any significant advancement as regards earlier diagnosis will be made in the near future; therefore it seems desirable that surgeons review their present methods and, in the light of present knowledge of the spread of the disease, endeavor to make changes in their procedures which may lead to an increase in the percentage of cures.

In a study of 47 operative specimens obtained from several hospitals (and removed by several different surgeons), the authors employed the following method: After gross examination and description of the opened fresh specimen, photographs in color and in black and white were obtained. The specimen was then pinned out on cardboard to minimize shrinkage and fixed in formalin. After fixation, the artist made a sketch of the specimen and indicated by dotted lines on the drawing, the locations of the blocks taken for microscopic examination. The blocks taken were very large (limited in size only by the size of the slides—about 3 by 5 inches). Several sections were made through each block and all were carefully studied.

In 30 cases in which the tumor lay grossly within 5 cm. of the pylorus, nine, or 30 per cent, showed carcinomatous invasion of the duodenum. The extent of this invasion varied and in practically every instance the invasion could not be discerned by gross examination. In six cases of cancer of the cardiac end of the stomach, five showed invasion of the esophagus. The invasion was grossly apparent in two of these cases. The greatest length of microscopic invasion was 25 mm. beyond the apparent edge of the tumor. In the stomach wall, microscopic invasion varied greatly. No correlation could be recognized between the gross or microscopic appearance of the tumor and its tendency to invade.

In view of these findings the authors conclude that the need for wide resection of cancer of the stomach must be reaffirmed. For operations for cancer of the stomach, the authors state a preference for combined abdominothoracic incision.

SURGICAL TREATMENT OF INSIDIOUS THROMBOSIS OF THE AORTA. Daniel C. Elkin, and Frederick W. Cooper, *Ann. Surg. 130*:417-427 (Sept.) 1949.

Though this condition has previously been considered to be very rare, the authors have seen ten cases in the twenty months preceding this report. Though seven cases were reported by Welch as early as 1898 and though by 1943 Greenfield was able to collect 156 cases including five of his own, Leriche's classic description published only last year has served to focus attention on the syndrome which is coming to bear his name.

Since the bifurcation of the aorta is one of the most frequent sites of atherosclerosis with the formation of ragged, plaque-like or ulcerated atheromata, it is a susceptible site for the formation of a thrombus. Death usually results from the propagation of the thrombus upwards to involve the origin of the renal arteries.

Pain in the lower extremities, weakness and loss of stamina in the thighs and legs and impotence are the predominant symptoms. The diagnosis is usually made with the history of insidious onset of these symptoms together with the absence of peripheral pulsation and trophic changes in the lower extremities. The history may cover a period of years. Though instrumental observations are useful to substantiate clinical evidence, they are not essential

for diagnosis. In this series, the authors have employed skin temperature readings, oscillometric readings and ballistocardiograms. The Nickerson ballistocardiograph was the instrument chosen because of its damping mechanism which results in the exclusion of all deflections other than those of the initial impact. Roentgenograms often reveal increased calcification of the terminal aorta. In two cases, aortogram with contrast media clearly demonstrated the upper level of the obliteration.

Though Leriche has suggested that ideal treatment would be resection of the involved segment and bridging of the vascular defect by graft, the extent of the lesion into the common iliac trunks makes this attack unfeasible. Sympathectomy and resection of the involved segment are indicated. The resection performs a twofold purpose—removal of the trombus, propagation of which will result in death; and removal of the excitatory area in the reflex arc producing vasoconstriction in the collaterals. With any method of treatment the prognosis is grave.

Brief descriptions of the 10 cases are presented. The authors conclude that this disease is more prevalent than it has been assumed to be.

Clinical Evaluation of a New Bactericidal Agent. Allen J. Ryan; Florence M. Stone; Elizabeth B. Ramsey, and Elizabeth Johnston, *Am. J. Surg. 78:*446-457 (Oct.) 1949.

At the request of the Council of National Defense, the authors have undertaken to evaluate the effectiveness of this new bactericidal agent in vivo. Heliogen is a white powder composed of a mixture of Chloramin-T, potassium iodide, dextrose and sodium biphosphate in certain definite proportions. The pH of the preparation is close to neutrality. On contact with moisture, iodine is released. A small amount of ultraviolet radiation is produced by the reaction, hence the name "Heliogen."

Tests in vitro had proved the compound to be effective against a wide variety of organisms. In the clinical studies, the compound was used in two forms, a powder for the preparation of a solution and a powder for dry application with a much lower iodine content.

In the first series, no controls were used but all but two of the 21 patients had chronically infected wounds which had failed to respond to various other treatments including antiseptics and the sulfonamides. In the second series, patients were selected and assigned in rotation for one of four types of therapy: saline and peroxide (10 cases), compound solution of iodine USP (10 cases) and azochloramid in saline (10 cases). In Series III, cases were selected and assigned as in Series II. The substances used were: 1) sterilized, buffered sulfaniamide powder, 2) sterilized sodium sulfadiazine powder, 3) sterilized saturated sodium sulfate solution and heliogen (10 cases each).

The authors, admitting the limited number of cases, concluded that heliogen is not toxic, is successful in clearing up the odor and discharge of infected wounds with free drainage, and that wounds which had remained static under various other therapies, responded favorably to heliogen. It is suggested that heliogen may be a valuable aid in the treatment of infected wounds.

Potassium Deficiency in Surgical Patients. Henry Y. Randall; David V. Habif; John S. Lockwood, and S. C. Werner, *Surgery 26:*341-363 (Sept.) 1949.

Since the amount of potassium in the body exceeds that of sodium by a ratio

of two to one, the rôle of this, the body's main cation, has been the object of much physiologic investigation during the past 35 years. The work covered in this paper is a partial report of the intensive study of electrolyte and fluid balance which has been conducted at the Columbia-Presbyterian Medical Center in New York since 1947.

Following a concise review of the literature on this subject, the authors present a detailed discussion of the methods of study employed with results of determinations of losses by various routes of potassium, sodium and chlorides in patients under various nutritional conditions. Detailed reports of three cases are given.

The authors observe that many of the conditions which are known to result in potassium loss coexist in the surgical patient. Reduced potassium intake, increased loss from the gastrointestinal tract, loss due to administration of other cations intravenously, and loss due to induced alkalosis all probably exist to some degree in the major surgical case. The results of these studies would seem to confirm the observation of other investigators that, in minor surgical procedures at least, parenteral administration of fluids has more of an effect on the loss of potassium than does the operation itself.

The symptoms of potassium deficiency are divided into two groups. The first of these is the acute syndrome of skeletal muscular weakness. More commonly seen is a diffuse symptom complex with onset from the fourth to the ninth day consisting of drowsiness, languor, chronic ileus, anorexia and weakness possibly accompanied by peripheral edema, oliguria and hemoconcentration. The symptom pattern is not altogether specific.

The authors have not exceeded a concentration of 30 milli-equivalents of potassium per liter. On the surgical service, the solution most frequently employed for potassium replacement contains 30 mEq. of K and 30 mEq. of chloride ion per liter in a 5 per cent glucose solution.

Certain specific contraindications to the use of these solutions are pointed out. Unless there is definite laboratory evidence that definite potassium deficiency exists, the solutions are withheld in severely dehydrated patients until hydration is well under way as is indicated by a falling hematocrit and rising urinary output. In patients with acute or chronic renal disease, potassium is not given unless serum potassium is low and the indications are very definite, and then only with great caution. Potassium solutions are not used during or within the first 24 hours following major surgery. Following these precautions, the authors have observed no cases of potassium intoxication. The use of such solutions is general on their service. Therapeutic dosage is considered to be from 60 to 120 mEq. per day with due regard to the total fluid volume which is permissible to the patient being treated. Prophylactically, 30 mEq. is given to patients in whom parenteral nutrition is planned to be continued for four or more days. This dosage is begun on the second postoperative day. Oral therapy with a mixture of 1 Gm. each of potassium acetate, bicarbonate and citrate made up to a volume of 8 c.c. with water given in dosage of 4 c.c. three times a day well diluted in fruit juice may, in patients who are tolerating fluids, eliminate the necessity for parenteral administration.

"We feel that the therapeutic and prophylactic use of potassium salts in certain surgical conditions will probably be increasingly indicated to replace or anticipate deficits which have been demonstrated to occur. However, the management of potassium requirements must always be integrated with an over-all program of physiologic water and electrolyte replacement."

INTESTINAL OBSTRUCTION IN THE NEWBORN. Donald M. Glover, and Frank McA. Barry, *Ann. Surg. 130*:480-511 (Sept.) 1949.

Though the prognosis in intestinal obstruction in the newborn has not kept pace with the improvement of the prognosis in the adult during the past quarter century, considerable progress has been made. The author points out that 20 years ago, very few cases of obstruction in the newborn due to anomalies had been successfully treated. The author points out that it would be impossible to overestimate the importance of the contributions of the Boston Children's Hospital group during the past 30 years.

That recoveries are no longer considered rarities does not minimize the fact that the mortality rate in obstruction in the newborn remains quite high. The more pertinent causes of mortality include frequency of prematurity as a complicating factor, delayed operation due to tardy diagnosis or procrastination on the part of the surgeon, inadequate supportive therapy, and poor surgery.

In regard to diagnosis the authors emphasize that bile in the vomitus and abdominal distention during the first day of life must be considered to be due to intestinal obstruction until proved otherwise. Except when the obstruction is very high in the duodenum, the vomiting is unlikely to be projectile in character. Plain or "flat" plate of the abdomen with the infant in upright position is the most valuable aid in diagnosis. Usually the diagnosis will be clear with the clinical picture and this simple x-ray. If not, barium may be employed with caution.

In the field of supportive therapy, the greatest strides have been made. Ability to administer adequate quantities of blood before, during, and after operation, together with the ability to control postoperative infection by employment of the antibiotics, have greatly widened the limits of operability. It is emphasized that the incision should not be made until the needle is in the vein (or bone marrow) and the blood is running satisfactorily.

A lucid discussion of operative management and technical considerations is presented in which it is emphasized that intelligent assay of the probabilities based on a thorough knowledge of the developmental anatomy of the intestinal tract is of utmost importance. The various types of intrinsic and extrinsic obstructions are described with a discussion of the operative treatment in each instance.

Forty-seven case reports are presented. The overall mortality rate was 57 per cent. The mortality rate in the intrinsic group was 75 per cent and the rate increased as the point of obstruction progressed caudad. In the two cases in which the intrinsic obstruction was in the colon, the mortality was 100 per cent. The possible surgical errors are studied. It was felt the death could be attributed to technical errors in about 50 per cent of the instances, to incomplete operation in the majority of the remaining instances. Insufficient blood transfusion was considered to be a factor in only four instances (about 15 per cent).

THREE CHILDREN SUCCESSFULLY OPERATED UPON FOR CONGENITAL ATRESIA OF THE ESOPHAGUS WITH ESOPHGEO-TRACHEAL FISTULA. R. H. Franklin, *Proc. Roy. Soc. Med. 42*:507-510 (July) 1949.

When possible, the author uses direct anastomosis with interrupted fine silk sutures using the "telescopic" method of Cameron in which the whole thickness of the lower segment is anastomosed to the mucous membrane of the up-

per segment, allowing the comparatively thick muscular coat of the upper segment to surround the anastomoses like a cuff. The postoperative administration of penicillin solution by mouth is emphasized.

A Case of Diaphragmatic Hernia of Congenital Origin with Perforation of the Stomach. S. B. Bradley and H. P. Goldsmith, *Brit. M. J.*, 366-637 (Aug. 13) 1949.

The case of a perforation of a pyloric ulcer in a 29 year old man with a left [illegible] completely intrathoracic stomach is reported. Due to a complete peritoneal sac, there was no infection of the pleural cavity. The hernia could not be reduced and the perforation was repaired through the opening in the diaphragm. The stomach was completely rotated with the greater curvature uppermost. The history and physical findings were no different from those in ordinary perforation of peptic ulcer. The patient recovered.

INDEX TO VOLUME XV

Abstracts from Current Literature are grouped together and are indexed under that heading in alphabetical order.

Book Reviews are grouped together and are indexed under that heading in alphabetical order.

A

Absence of pectoralis major muscle: See Hayes

Absence of pectoralis minor muscle: See Hayes

Abstracts from Current Literature:

Anatomy of Hernial Regions, H. J. Anson et al, 940

Cancer of Breast, H. G. Bell, 939

Cancer of Gallbladder; Report of a 5 Year Cure of Anaplastic Carcinoma with Metastasis, R. J. Booker, and G. T. Pack, 883

Case of Diaphragmatic Hernia of Congenital Origin with Perforation of Stomach, S. B. Bradley and H. P. Goldsmith, 947

Clinical Evaluation of New Bactericidal Agent, A. J. Ryan et al, 944

Congenital Anal Stricture, J. Liburt, 883

Diagnosis of Preinvasive Carcinoma of Cervix, J. Skapier, 939

Extension of Carcinoma of Stomach into Duodenum and Esophagus, M. M. Zinninger and W. T. Collins, 942

Hemipelvectomy, M. M. Ravitch, 885

Indication for and Results following Exploration of Common Bile Duct for Stones, L. S. McKittrick and N. J. Wilson, 879

Intestinal Obstruction in Newborn, D. M. Glover and F. McA. Barry, 946

Intussusception in Infants and Children; Report of 143 Consecutive Cases, W. H. Snyder et al, 880

Late Results in Treatment of Pancreatic Cysts by Internal Drainage, D. H. Poer and R. H. Stephenson, 881

Peptic Ulcer following Splanchnicectomy; Report of 13 Cases, S. C. Mason and H. M. Pollard, 882

Potassium Deficiency in Surgical Patients, H. Y. Randall et al, 944

Predisposing Action of Anesthetic Agents on Vascular Responses in Hemorrhagic Shock, B. W. Zweifach and S. G. Hershey, 942

Primary Epithelioma of Ureter, B. A. Smith, 884

Recent Advances in Surgery of Colon, B. M. Black, 883

Saphenous Phlebectomy for Varicose Veins during Pregnancy, F. W. Peyton and F. A. Loop, 884

Significance of Ulcerating Lesion in Stomach following Gastroenterostomy, H. K. Gray and K. A. Lofgren, 882

Studies in Acute Cholecystitis, J. E. Dunphy and F. P. Ross, 941

Study of Mortality in a Burns Unit, J. P. Bull and J. R. Squire, 881

Surgical Treatment of Insidious Thrombosis of Aorta, D. C. Elkin and F. W. Cooper, 943

Three Children Successfully Operated upon for Congenital Atresia of Esophagus with Esophago-Tracheal Fistula, R. H. Franklin, 947

Total Pancreatectomy for Hyperinsulinism due to Islet-Cell Adenoma: Follow-Up Report 5½ Years after Operation, including Metabolic Studies, J. T. Priestly et al, 884

Tumors of Testicle—Relationship of Structure to Course and Prognosis, N. R. Wyndham, 880

Volvulus of Midgut, M. R. MacCharles and C. W. Clark, 881.

Acute intestinal obstruction: See Wilson, J. M.

Acute Obstruction of Small Bowel, E. M. Farris, 628

Air bubble in pancreatic duct simulating common duct calculus: See Long, L.

Aldredge, W. M.: See Parker

Alrich, E. M.: Radial Nerve Division, 120 See Burger

Anderson, H. M.: See Burton

Anderson, K. J., and Brock, L. W.: Spondylolisthesis: A Rare Variant with a Unilateral Isthmus Defect and Slight Displacement, 470

Aneurysms, intracranial: See Echols, Jaeger

Annular Pancreas, R. E. Burger and E. M. Alrich, 85

Anuria, G. H. Ewell, 457

Arteriovenous fistula of lower extremities: See Johnson

Ascites: See Koontz

B

Bacon, H. E., and Vaughan, G. D.: Surgical Management of Lower Bowel without Colostomy, 270

Beasley, B. T.: When a Doctor Completes his Medical Education He Should Retire, Editorial, 288

Becker, W. F.: See Marshall

Bell, A. H., and Richey, H. M.: Carcinoma of Jejunum: Brief Discussion and Case Report, 616

Berry, C. T.: Intramedullary Nailing of Fractures of Shaft of Femur, 907

Berry, R. E. L.: See Moyer

Bilateral apical pulmonary tuberculosis: See Wilson, D. A.

Biloxi Meeting in Retrospect, Editorial, R. L. Sanders, 448
Blaine, B. C.: See Long, L.
Blocker, T. G., Jr.: Reconstructive Surgery of Congenital and Traumatic Deformities of the Face, 777
Blount, R. E., and Lumpkin, L. U.: Placenta Accreta with Velamentous Insertion of the Cord—Report of a Case Treated by Hysterectomy following Normal Delivery, 411
Book Reviews:
Atlas of Surgical Operations, E. C. Cutler and R. M. Zallinger, 937
Care of Surgical Patient, J. Fine, 805
Clinical Aspects and Treatment of Surgical Infections, F. L. Meleney, 805
Companion in Surgical Studies, I. Aird, 877
Operations of General Surgery, T. G. Orr, 878
Operative Surgery, F. C. Hill, 877
Operative Technics in General Surgery, edited by W. H. Cole, 735
Operative Technique and Specialty Surgery, edited by W. H. Cole, 937
Practical Aspects of Thyroid Diseases, G. Crile, Jr., 805
Textbook of Surgery by American Authors, edited by F. Christopher, 937
Urological Aspects of Spinal Cord Injuries, G. C. Prather, 877
Bradshaw, H. H.: See Mason
Breast, carcinoma of: See Parker
Breck, L. W.: See Anderson
Bretz, J. M.: See Welborn
Brindley, G. V.; Covert, F. M., and Long, S. McL.: Massive Hemorrhage from the Upper Digestive Tract with Special Reference to the Peptic Ulcer, 887
Bronchiogenic Carcinoma, J. Camblos; M. L. White, Jr., and E. C. Drash, 104
Brown, J. S., Jr.: Disease of Epiploic Appendices; Report of 2 Cases, 701
Brown, L. A.: Is There Anything Really New in Otolaryngology?, Editorial, 188
Bryant, L.: See Moyer
Buck, G. C., Jr., and Guthrie, R. F.: Toxic Sublingual Goiter, 767
Burger, R. E., and Alrich, E. M.: Annular Pancreas, 85
Burnett, H. A.: See Dodson
Burton, J. F., and Anderson, H. M.: Injuries of Larynx and Trachea, 579
Bush, A. K.: Cancer of Rectum: What Constitutes Adequate Resection?, 512
Butt, T. C.: See Orr

C

Camblos, J.; White, M. D., Jr., and Drash, E. C.: Bronchiogenic Carcinoma, 104
Cancer of Cervix as seen in a Rural Community, W. H. Cave, 332
Cancer, incurable: See Cooper
Cancer of Rectum: What Constitutes Adequate Resection?, A. K. Bush, 512
Carcinoma of Breast occurring during Pregnancy and Lactation, J. M. Parker and W. M. Aldredge, 550
Carcinoma, bronchiogenic: See Camblos
Carcinoma of colon: See Elkin, Mayo, C. W.
Carcinoma at Confluence of Hepatic Bile Ducts. A Case Report, G. E. Sanford and C. C. Lowry, 758
Carcinoma of duodenum: See Welborn
Carcinoma of esophagus: See Kisner
Carcinoma of jejunum: Brief Discussion and Case Report, A. H. Bell and H. M. Richey, 616
Carcinoma of liver: See Woods
Carcinoma of lower portion of colon and rectum: See Mayo, C. W.
Carcinoma of lung: See Fair
Carcinoma of pancreas: See Sanders
Carcinoma of rectum: See Mayo, C. W.
Carcinoma of third portion of duodenum: See Welborn
Carcinomatosis, leptomeningeal: See Martinez-G.
Care of Surface Injuries of Hand, Editorial, W. G. Stuck, 370
Cave, W. H.: Cancer of Cervix as Seen in a Rural Community, 332
Cervix, cancer of: See Cave
Chappell, B. S., and Vest, S. E.: Mortality following Prostatic Surgery with Special Reference to Role of Chemotherapy, 89
Chemotherapy in prostatic surgery: See Chappell
Child and Infant Surgery, R. S. Widmeyer, 29
Clinical Pathologic Conference, B. Halpert and J. M. Parker, 555
Clots, intracranial: See Martinez-G.
Coller, F. A.: See Moyer
Colles' fracture of wrist: See Rush
Colon, carcinoma of: See Elkin, Hunt.
Colon, carcinoma of: See Elkin, Hunt, F. A.
Colon, multiple carcinoma of: See Elkin
Colon, non-obstructive lesions of: See Lockwood
Common bile duct stricture: See Wilson, H.
Common Duct Calculus Simulated by Air Bubble in Pancreatic Duct, L. Long; A. L. Evans and B. C. Blaine, 501
Congenital Anomalies of Gastrointestinal Tract in Infants and Children, G. H. Martin, 163
Congenital Absence of the Pectoralis Major Muscle in Whole or in Part and the Absence of the Pectoralis Minor Muscle (Unilateral)—Report of 3 Cases, W. M. Hayes, 417
Congenital Arteriovenous Fistula of Lower Extremities with Pelvic Complications, W. O. Johnson, 795
Congenital deformities of face: See Blocker
Congenital Pyloric Stenosis, E. B. Neff, 623
Control of pain: See Haynes

Cooper, G., Jr.: Management of Incurable Cancer, 136
Covert, F. M: See Brindley
Cranial cerebral injuries: See Jelsma
Crutchfield, W. G.: See Martinez-G.

D

DeSaussure, R. L.: See Martinez-G.
Diagnosis of surgical jaundice: See Webb
Diagnosis and Treatment of Intracranial Aneurysms, D. H. Echols and F. C. Rehfeldt, 782
Disease of Epiploic Appendices; Report of 2 Cases, J. S. Brown, Jr., 701
Disseminated Calcification of Pancreas, with Case Report, L. P. Good, 857
Diverticulitus of Colon, W. A. Johns, 922
Dr. Ephraim McDowell, Editorial, J. B. Lukins, 37
Dodson, H. C., Jr., and Burnett, H. A.: Experiences with Spool Cotton Suture Material, 571
Does the Pathologist Need the Clinician's Cooperation?, P. P. Ladewig, 927
Douglas, G. E.: The Human Ovary: Am I My Brother's Keeper?, 833
Drash, E. C.: See Camblos
Dunavant, D., and Gillespie, C. E.: Sarcoma of Rectum, 916
Duodenal ulcer: See Sandusky
Duodenum, carcinoma of: See Welborn

E

Echols, D. H., and Rehfeldt, F. C.: Diagnosis and Treatment of Intracranial Aneurysms, 782
Editorials:
Biloxi Meeting in Retrospect, R. L. Sanders, 448
Care of Surface Injuries of Hand, W. G. Stuck, 370
Dr. Ephraim McDowell, J. B. Lukins, 37
Editorial, L. J. Starry, 656
Historical Review of Development of Cesarean Section, B. Word, 723
Is There Anything Really New in Otolaryngology?, L. A. Brown, 188
The Southwestern Surgical Congress: The Need—The Aims, L. P. Good, 541
Surgical Shock, E. B. Hay, 874
Threat to Surgical Training?, E. P. Lehman, 149
Treatment of Varicose Veins by Excision Preferable to Ligation and Injection, W. H. Prioleau, 935
What Should the General Surgeon Do with his Prostatic Patient?, C. C. Howard, 801
When a Doctor Completes his Medical Education He Should Retire, B. T. Beasley, 288
Elkin, D. C., and Martin, J. D., Jr.: Multiple Carcinoma of Colon; Report of a Case, 453
Ellis, J. T.; Windham, S. W., and Latiolais, S. G.: Hydrocele of Canal of Nuck, 718
Embolectomy at bifurcation of aorta: See Wolff
Emergency Thyroidectomy. A Case of Intracapsular Hemorrhage in an Intrathoracic Goiter, D. McEwan and R. E. Zellner, 489
Epiploic appendices: See Brown, J. S., Jr.
Esophagus, carcinoma of: See Kisner
Evans, A. L.: See Long, L.
Ewell, G. H.: Anuria, 457
Surgical Approach to Hypertension, 711
Excretion of water and salt: See Moyer
Experience with the Peritoneal Button Operation for Ascites, A. R. Koontz, 765
Experiences with Spool Cotton Suture Material, H. C. Dodson, Jr., and H. A. Burnett, 571
Extrahepatic biliary ducts, traumatic strictures of: See O'Leary
Extremities, vascular accidents of: See Grace

F

Face, congenital and traumatic deformities of: See Blocker
Factors Influencing Selection of Operation for Carcinoma of Lower Portion of Colon and Rectum, C. W. Mayo, 291
Fair, E.: Primary Carcinoma of Lung, 584
Farris, E. M.: Acute Obstruction of Small Bowel, 628
Fibrolipomatous nodules: See Butt
Fistula, vesicovaginal: See Tyrone
Foreign bodies, intrapericardial: See Sandusky
Fractures, Colles': See Rush
Fractures of femur: See Berry, C. T.
Fractures, intertrochanteric: See Funsten
Fractures of shaft of femur: See Berry, C. T.
Fractures of wrist: See Rush
Frankel, C. J.: See Funsten
Freed, J. E.: See Lemmon
Fundamental Principles of Thyroidectomy, M. Nordland, 375
Funsten, R. V., and Frankel, C. J.: Treatment of Intertrochanteric Fractures, 93

G

Gastrointestinal tract, congenital anomalies of: See Martin, G. H.
Gay, L. A.: See Lockwood
Gillespie, C. E.: See Dunavant
Glycerin Osmotic Drainage in Peritonitis, E. D. Smith and R. W. Smith, 18
Goiter: See Buck
Goiter, sublingual: See Buck
Goiter, toxic sublingual: See Buck

Good, L. P.: Disseminated Calcification of Pancreas, with Case Report, 857.
The Southwestern Surgical Congress: The Need—The Aims, Editorial, 541
Grace, K. D.: Vascular Accidents of Extremities, 359
Graham, C. P.: See Robertson, J. F.
Greenfield, J., and Smoak, P. L.: Intussusception due to Invaginated Meckel's Diverticulum in Adults, 505
Griswold, R. A.: Physiologic Changes Following Vagotomy for Peptic Ulcer, 1
Guthrie, R. F.: See Buck

H

Halpert, B., and Parker, J. M.: Clinical Pathologic Conference, 555
Hamm, W. G., and Kanthak, F. F.: Plastic Repair of Injuries to Male Genitalia, 339
Harlin, H. C.: Management of Traumatic Perforation and Constrictive Kinking of a Postlithotomy Ureter, 789
Hay, E. B.: Surgical Shock, Editorial, 874
Hayes, W. M.: Congenital Absence of Pectoralis Major Muscle in Whole or in Part and the Absence of the Pectoralis Minor Muscle (Unilateral)—Report of 3 Cases, 417
Haynes, W. G.: Pain: Its Physiology and Control, 687
Hemothorax, management of: See Moore
Hepatectomy, left, for primary carcinoma of liver: See Woods
Hip, traumatic dislocation of: See Stuck
Historical Review of Development of Cesarean Section, Editorial, B. Word, 723
Howard, C. C.: What Should the General Surgeon Do with his Prostatic Patient?, Editorial, 801
Howard, R. B.: See Lingenfelder
Human Ovary: Am I My Brother's Keeper?, G. E. Douglas, 833
Hunt, C. J.: Surgical Treatment of Malignant Lesions of Colon Complicated by Inflammatory Reaction, Fixation or Obstruction, 248
Hydrocele of Canal of Nuck, J. T. Ellis; S. W. Windham, and S. G. Latiolais, 718
Hyperparathyroidism, N. M. Smith and W. R. Sandusky, 113
Hypertension, surgical approach to: See Ewell

I

Incorrect Knot-Tying, Cause for Broken Sutures, S. V. Ward, 354
Infant Surgery: See Martin, Widmeyer
Injuries of Larynx and Trachea, J. F. Burton and H. M. Anderson, 579
Injuries to male genitalia: See Hamm
Intertrochanteric fractures: See Funsten
Intestinal obstruction: See Wilson, J. M., Farris
Intracranial Aneurysms, R. Jaeger, 205
See Echols
Intracranial clots: See Martinez-G.
Intramedullary Nailing of Fractures of Shaft of Femur, C. T. Berry, 907
Intrapericardial Foreign Bodies, W. R. Sandusky, 125
Intussusception due to Invaginated Meckel's Diverticulum in Adults, J. Greenfield and P. L. Smoak, 505
Invaginated Meckel's diverticulum in adults: See Greenfield
Iob, V.: See Moyer
Is There Anything Really New in Otolaryngology?, Editorial, L. A. Brown, 188

J

Jaeger, R.: Intracranial Aneurysms, 205
Jaundice: See Webb
Jaundice, surgical: See Webb
Jelsma, F.: Management of Cranial Cerebral Injuries, 346
Jejunal ulcer: See Sandusky
Jejunum, carcinoma of: See Bell
Johns, W. A.: Diverticulitis of Colon, 922
Johnson, W. O.: Congenital Arteriovenous Fistula of Lower Extremities with Pelvic Complications, 795

K

Kalder, N. B.: See Moyer
Kanthak, F. F.: See Hamm
Kisner, W. H.: Present Status of Surgical Treatment of Carcinoma of Esophagus, 478
Kittredge, W. E., and Whitehead, M.: Subcapsular Nephrectomy—Its Indications and Advantages, 403
Knight, C. D.: See Price
Koontz, A. R.: An Experience with the Peritoneal Button Operation for Ascites, 765

L

Ladewig, P. P.: Does the Pathologist Need the Clinician's Cooperation?, 927
Larynx, injuries of: See Burton
Latiolais, S. G.: See Ellis
Lead Poisoning in Infancy—A Case in Which 2 Operations were Performed on the Stomach, W. L. Sibley, 427
Lehman, E. P.: A Threat to Surgical Training?, Editorial, 149
Lemmon, C. J., Jr., and Freed, J. E.: Results of Prefrontal Leukotomy at The South Carolina State Hospital, 849
Leptomeningeal Carcinomatosis, J. de D. Martinez-G.; R. L. DeSaussure, and W. G. Crutchfield, 140
Leukotomy, prefrontal: See Lemmon
Lingenfelder, F. M., and Howard, R. B.: Surgical Treatment of Thyroid Disease, 611

Liver, Carcinoma of: See Woods
Liver, needle biopsy of: See Webb
Lockwood, I. H., and Gay, L. A.: Non-Obstructive Lesions of Colon, 437
Long, L.; Evans, A. L., and Blaine, B. C.: Common Duct Calculus Simulated by Air Bubble in Pancreatic Duct, 501
Long, S. McL.: See Brindley
Longitudinal Pin Fixation in Colles' Fracture of Wrist, L. V. Rush and H. L. Rush, 679
Lowry, C. C.: See Sanford
Lukins, J. B.: Dr. Ephraim McDowell, Editorial, 37
Lumpkin, L. U.: See Blount
Lung, carcinoma of: See Fair
Lung, primary carcinoma of: See Fair

M

McClure, J. N.: See Woods
McDonald, H. P.; Upchurch, W. E., and Sturdevant, C. F.: A New Scrub-Up Technic for Surgeons, 676
McEwan, D., and Zellner, R. E.: Emergency Thyroidectomy. A Case of Intracapsular Hemorrhage in an Intrathoracic Goiter, 489
Malignant lesions of colon: See Elkin, Hunt, Mayo, C. W.
Management of Acute Intestinal Obstruction, J. M. Wilson and W. A. Yemm, 529
Management of Cranial Cerebral Injuries, F. Jelsma, 346
Management of Hemothorax, J. A. Moore, 255
Management of Incurable Cancer, G. Cooper, Jr., 136
Management of Severe Bleeding from Gastric, Duodenal and Jejunal Ulcers, W. R. Sandusky and H. W. Mayo, Jr., 71
Management of Traumatic Perforation and Constrictive Kinking of a Postlithotomy Ureter, H. C. Harlin, 789
Mandible, pseudomonas of: See Reichmann
Marsh, H. F.: See Reichmann
Marshall, S. F., and Becker, W. F.: Tumors of Neck, 300
Martin, G. H.: Congenital Anomalies of Gastrointestinal Tract in Infants and Children, 163
Martin, J. D., Jr.: See Elkin
Martinez-G., J. de D., and Crutchfield, W. G.: Ventriculography in Localization of Aberrant Post-Traumatic Intracranial Clots, 99
DeSaussure, R. L., and Crutchfield, W. G.: Leptomeningeal Carcinomatosis, 140
Mason, L. B.; Postlethwaite, R. W., and Bradshaw, H. H.: Meckel's Diverticulum. Report of 30 Cases, 749
Massive Hemorrhage from the Upper Digestive Tract with Special Reference to the Peptic Ulcer, G. V. Brindley, F. M. Covert and S. McL. Long, 887
Mathers, F.: See Orr
Mathews, W. R.: See Price
Mayo, C. W.: Factors influencing Selection of Operation for Carcinoma of Lower Portion of Colon and Rectum, 291
Mayo, H. W., Jr.: See Sandusky
Meckel's diverticulum: See Greenfield
Meckel's Diverticulum. Report of 30 Cases, L. B. Mason, R. W. Postlethwaite and H. H. Bradshaw, 749
Melanoma, V. H. Price, C. D. Knight and W. R. Mathews, 316
Metycaine Saddle Block Analgesia in Obstetrics, H. B. Turner, 151
Moore, J. A.: Management of Hemothorax, 255
Morris, K. A.: See Wood
Mortality following Prostatic Surgery with Special Reference to the Role of Chemotherapy, B. S. Chappell and S. E. Vest, 89
Moyer, C. A.; Coller, F. A.; Iob, V.; Bryant, L.; Vaughn, H.; Kalder, N. B., and Berry, R. E. L.: Some Effects of an Operation, Anesthesia and Composition of Parenteral Fluids upon the Excretion of Water and Salt, 218
Multiple Carcinoma of Colon; Report of Case, D. C. Elkin and J. D. Martin, Jr., 453

N

Neck, tumors of: See Marshall
Needle Biopsy of the Liver in the Diagnosis of Surgical Jaundice, J. B. Webb and S. Werthammer, 393
Neff, E. B.: Congenital Pyloric Stenosis, 623
Nephrectomy: See Kittredge
Nephrectomy, subcapsular: See Kittredge
New Scrub-Up Technic for Surgeons, H. P. McDonald, W. E. Upchurch and C. F. Sturdevant, 676
Non-Obstructive Lesions of Colon, I. H. Lockwood and L. A. Gay, 437
Nordland, M.: Fundamental Principles of Thyroidectomy, 375

O

Observations on a Method of Thoracolumbar Sympathectomy, C. E. Troland, 773
Obstetrics, metycaine saddle block analgesia in: See Turner
O'Donoghue, D. H.: Place of Patellectomy in Treatment of Fractures of Patella, 640
O'Leary, C. M., and Snoddy, W. T.: Traumatic Strictures of Extrahepatic Biliary Ducts, 599
Orr, L. M.; Mathers, F., and Butt, T. C.: Somatic Pain Produced by Fibrolipomatous Nodules Simulating Urinary Tract Pathology, 737
Ovary: See Douglas

P

Pack, G. T.: See Trevor
Pain: Its Physiology and Control, W. G. Haynes, 687
Pain, postcholecystectomy: See Twente
Palliative Operations for Carcinoma of the Pancreas, R. L. Sanders and C. H. Porter, 383
Pancreas, annular: See Burger
Pancreas, calcification of: See Good
Pancreas, carcinoma of: See Sanders
Pancreas, disseminated calcification of: See Good
Paralytic Ileus, G. E. Stanbro, 562
Parker, J. M., and Aldredge, W. M.: Carcinoma of Breast Occurring during Pregnancy and Lactation, 550
See Halpert
Patella, fractures of: See O'Donoghue
Patellectomy in treatment of fractures of patella: See O'Donoghue
Peptic Ulcer: See Brindley, Griswold, Sandusky
Peritoneal button operation for ascites: See Koontz
Peritonitis: See Smith, E. D.
Physiologic Changes following Vagotomy for Peptic Ulcer, R. A. Griswold, 1
Physiology of pain: See Haynes
Place of Patellectomy in Treatment of Fractures of the Patella, D. H. O'Donoghue, 640
Placenta Accreta with Velamentous Insertion of the Cord—Report of a Case Treated by Hysterectomy following Normal Delivery, R. E. Blount and L. U. Lumpkin, 411
Plastic Procedures for the General Surgeon, C. C. Trabue, 322
Plastic Repair of Injuries to the Male Genitalia, W. G. Hamm and F. F. Kanthak, 339
Pomerantz, R. B.: Vascular Spasm in Battle Injuries, 521
Porter, C. H.: See Sanders
Postcholecystectomy Pain, G. E. Twente, 826
Postlethwaite, R. W.: See Mason
Post-traumatic intracranial clots: See Martinez-G.
Prefrontal leukotomy: See Lemmon
Present Status of the Surgical Treatment of Carcinoma of Esophagus, W. H. Kisner, 478
Prevention of Disability after Traumatic Dislocation of Hip, W. G. Stuck and W. H. Vaughan, 659
Price, V. H.; Knight, C. D., and Mathews, W. R.: Melanoma, 316
Primary Carcinoma of Liver; Report of Case Living and Well 25 Months after Left Hepatectomy, C. C. Woods and J. N. McClure, 539
Primary Carcinoma of Lung, E. Fair, 584
Primary Carcinoma of Third Portion of Duodenum, M. B. Welborn and J. M. Bretz, 493
Prioleau, W. H.: Treatment of Varicose Veins by Excision Preferable to Ligation and Injection, Editorial, 935
Proposed Revision of Constitution and By-Laws of The Southeastern Surgical Congress, 194
Prostatic Surgery: See Chappell
Prostatic surgery, mortality in: See Chappell
Pseudomonas Infection of Mandible, with Discussion and Case Report, F. J. Reichmann; G. E. Reynolds, Jr., and H. F. Marsh, 606
Pyloric stenosis, congenital: See Neff

R

Radial Nerve Division, E. M. Alrich, 120
Recent Advances in Surgery of Temporal Bone, F. D. Woodward, 145
Reconstructive Surgery of Congenital and Traumatic Deformities of the Face, T. G. Blocker, Jr., 777
Rectum, cancer of: See Bush, Mayo, C. W.
Rectum, sarcoma of: See Dunavant
Rehfeldt, F. C.: See Echols
Reichmann, F. J.; Reynolds, G. E., Jr., and Marsh, H. F.: Pseudomonas Infection of Mandible, with Discussion and Case Report, 606
Results of Prefrontal Leukotomy at The South Carolina State Hospital, C. J. Lemmon, Jr., and J. E. Freed, 849
Reynolds, G. E., Jr.: See Reichmann
Richardson, C. H., Jr.: Surgical Aspects of Thrombophlebitis, 695
Richey, H. M.: See Bell
Robertson, J. F., and Graham, C. P.: Treatment of Some Common Rectal Conditions, 283
Roster of The Southeastern Surgical Congress, 42
Rush, H. L.: See Rush, L. V.
Rush, L. V., and Rush, H. L.: Longitudinal Pin Fixation in Colles' Fracture of Wrist, 679

S

Sanders, R. L.: Biloxi Meeting in Retrospect, Editorial, 448
and Porter, C. H.: Palliative Operations for Carcinoma of the Pancreas, 383
Sandusky, W. R.: Intrapericardial Foreign Bodies, 125
and Mayo, H. W., Jr.: Management of Severe Bleeding from Gastric, Duodenal, and Jejunal Ulcers, 71
See Smith, N. M.
Sanford, G. E., and Lowry, C. C.: Carcinoma at Confluence of Hepatic Bile Ducts; A Case Report, 758

Sarcoma of Rectum, D. Dunavant and C. E. Gillespie, 916
Severe bleeding from gastric, duodenal, and jejunal ulcers: See Sandusky
Severe Tetany with Laryngospasm and Prolonged Coma following Thyroidectomy, J. H. Wood and K. A. Morris, 705
Sibley, W. L.: Lead Poisoning in Infancy—A Case in Which 2 Operations were Performed on the Stomach, 427
Small bowel, acute obstruction of: See Farris
Smith, E. D., and Smith, R. W.: Glycerin Osmotic Drainage in Peritonitis, 18
Smith, N. M., and Sandusky, W. R.: Hyperparathyroidism, 113
Smith, R. W.: See Smith, E. D.
Smoak, P. L.: See Greenfield
Snoddy, W. T.: See O'Leary
Somatic Pain Produced by Fibrolipomatous Nodules Simulating Urinary Tract Pathology, L. M. Orr, F. Mathers and T. C. Butt, 737
Some Effects of an Operation, Anesthesia and Composition of Parenteral Fluids upon the Excretion of Water and Salt, C. A. Moyer; F. A. Coller; V. Iob; L. Bryant; H. Vaughn; N. B. Kalder, and R. E. L. Berry, 218
Southwestern Surgical Congress; The Need —The Aims, Editorial, L. P. Good, 541
Spondylolisthesis: A Rare Variant with a Unilateral Isthmus Defect and Slight Displacement, K. J. Anderson and L. W. Brock, 470
Spool cotton suture material: See Dodson
Stanbro, G. E.: Paralytic Ileus, 562
Starry, L. J.: Editorial, 656
Stricture of Common Bile Duct, Etiology and Treatment, H. Wilson and F. M. Yates, 898
Strictures of extrahepatic biliary ducts: See O'Leary
Stuck, W. G.: Care of Surface Injuries of Hand, Editorial, 370
and Vaughan, W. H.: Prevention of Disability after Tramuatic Dislocation of Hip, 659
Sturdevant, C. F.: See McDonald
Subcapsular Nephrectomy—Its Indications and Advantages, W. E. Kittredge and M. Whitehead, 403
Successful Embolectomy at Bifurcation of Aorta, J. P. Wolff, 545
Surgical Approach to Hypertension, G. H. Ewell, 711
Surgical Aspects of Thrombophlebitis, C. H. Richardson, Jr., 695
Surgical jaundice: See Webb
Surgical Management of Lower Bowel without Colostomy, H. E. Bacon and G. D. Vaughan, 270
Surgical Shock, Editorial, E. B. Hay, 874
Surgical treatment of carcinoma of esophagus: See Kisner
Surgical Treatment of Malignant Lesions of Colon Complicated by Inflammatory Reaction, Fixation or Obstruction, C. J. Hunt, 248
Surgical Treatment of Thyroid Disease, F. M. Lingenfelder and R. B. Howard, 611
Sympathectomy, thoracolumbar: See Troland

T

Temporal bone surgery: See Woodward
Thoracolumbar sympathectomy: See Troland
Threat to Surgical Training?, Editorial, E. P. Lehman, 149
Thrombophlebitis: See Richardson
Thyroid, metastatic cancer of: See Trevor
Thyroidectomy: See McEwan, Nordland, Wood
Thyroidectomy, emergency: See McEwan
Thyroidectomy, fundamental principles of: See Nordland
Toxic Sublingual Goiter, G. C. Buck, Jr., and R. F. Guthrie, 767
Trabue, C. C.: Plastic Procedures for the General Surgeon, 322
Trachea, injuries of: See Burton
Traumatic deformities of face: See Blocker
Traumatic dislocation of hip: See Stuck
Traumatic Strictures of Extrahepatic Biliary Ducts, C. M. O'Leary and W. T. Snoddy, 599
Treatment of Bilateral Apical Pulmonary Tuberculosis, D. A. Wilson, 179
Treatment of Intertrochanteric Fractures, R. V. Funsten and C. J. Frankel, 93
Treatment of intracranial aneurysms: See Echols
Treatment of Metastatic Cancer of the Thyroid; A Report of Unusual Cases, W. Trevor and G. T. Pack, 9
Treatment of Some Common Rectal Conditions, J. F. Robertson and C. P. Graham, 283
Treatment of Varicose Veins by Excision Preferable to Ligation and Injection, Editorial, W. H. Prioleau, 935
Trevor, W., and Pack, G. T.: Treatment of Metastatic Cancer of Thyroid; A Report of Unusual Cases, 9
Troland, C. E.: Observations on a Method of Thoracolumbar Sympathectomy, 773
Tumors of Neck, S. F. Marshall and W. F. Becker, 300
Turner, H. B.: Metycaine Saddle Block Analgesia in Obstetrics, 151
Twente, G. E.: Postcholecystectomy Pain, 826
Tyrone, C.: Vesicovaginal Fistula: 1849-1949; The C. Jeff Miller Memorial Lecture, 809

U

Ulcer, gastric: See Sandusky
Ulcer, jejunal: See Sandusky
Ulcer, peptic: See Brindley, Griswold, Sandusky

University of Oklahoma School of Medicine Number, 545
University of Virginia Department of Medicine Number, 71
Upchurch, W. E.: See McDonald
Ureter, postlithotomy: See Harlin

V

Vagotomy for peptic ulcer: See Griswold
Vascular Accidents of Extremities, K. D. Grace, 359
Vascular Spasm in Battle Injuries, R. B. Pomerantz, 521
Vaughan, G. D.: See Bacon
Vaughan, W. H.: See Stuck
Vaughn, H.: See Moyer
Ventriculography in the Localization of Aberrant Post-Traumatic Intracranial Clots, J. de D. Martinez-G., and W. G. Crutchfield, 99
Vesicovaginal Fistula: 1849-1949; The C. Jeff Miller Memorial Lecture, C. Tyrone, 809
Vest, S. E.: See Chappell

W

Ward, S. V.: Incorrect Knot-Tying, Cause for Broken Sutures, 354
Webb, J. P., and Werthammer, S.: Needle Biopsy of Liver in Diagnosis of Surgical Jaundice, 393
Welborn, M. B., and Bretz, J. M.: Primary Carcinoma of Third Portion of Duodenum, 493
Werthammer, S.: See Webb
What Should the General Surgeon Do with his Prostatic Patient?, Editorial, C. C. Howard, 801
When a Doctor Completes his Medical Education He Should Retire, Editorial, B. T. Beasley, 288
White, M. L., Jr.: See Camblos
Whitehead, M.: See Kittredge
Widmeyer, R. S.: Child and Infant Surgery, 29
Wilson, D. A.: Treatment of Bilateral Apical Pulmonary Tuberculosis, 179
Wilson, H., and Yates, F. M.: Stricture of Common Bile Duct: Etiology and Treatment, 898
Wilson, J. M., and Yemm, W. A.: Management of Acute Intestinal Obstruction, 529
Windham, S. W.: See Ellis
Wolff, J. P.: A Successful Embolectomy at the Bifurcation of the Aorta, 545
Wood, J. H., and Morris, K. A.: Severe Tetany with Laryngospasm and Prolonged Coma following Thyroidectomy, 705
Woods, C. C., and McClure, J. N.: Primary Carcinoma of Liver; Report of Case Living and Well 25 Months after Left Hepatectomy, 539
Woodward, F. D.: Recent Advances in Surgery of Temporal Bone, 145
Word, B.: Historical Review of Development of Cesarean Section, Editorial, 723

Y

Yates, C. F.: See Wilson, H.
Yemm, W. A.: See Wilson, J. M.

Z

Zellner, R. F.: See McEwan

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